Fact Sheet for NPDES Permit WA0021148
City of Medical Lake Reclaimed Water Facility

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for The City of Medical Lake Reclaimed Water Facility.

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for The City of Medical Lake Reclaimed Water Facility, NPDES permit WA0021148, are available for public review and comment from May 20, 2014 until June 20, 2014. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

The City of Medical Lake reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, wastewater discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as **Appendix E - Response to Comments**, and publish it when issuing the final NPDES permit. Ecology will not revise the rest of the fact sheet, but the full document will become part of the legal history contained in the facility's permit file.

Summary

The City of Medical Lake operates an activated sludge wastewater treatment plant that discharges disinfected secondary effluent to a tributary of Deep Creek, Class A Reclaimed Water to West Medical Lake and the City's reclaimed water system. Ecology reauthorized the 2000 permit to the City of Medical Lake on April 28, 2005 as discharge limits and monitoring requirements did not change between the two permit cycles.

The proposed permit contains the same effluent limits as the previous permit issued in 2005 for all parameters expect for dissolved oxygen and a chlorine residual for Use Area #2, City Reclaimed Water Distribution. The effluent limit for dissolved oxygen increased from 6.0 mg/L to 8.5 mg/L based upon the classification of the receiving water body and updated Water Quality Standards for Surface Water. The chlorine residual addition reflects minimal standards necessary for reclaimed water beneficial use within the City of Medical Lake. Effluent limits for discharge to the tributary of Deep Creek are based upon Guidance for Water Quality Standards in Intermittent Streams. No reasonable potential calculations could be developed for this portion of the discharge as no receiving water body information could be obtained.

Table of Contents

I. Introduction ***5***

II. Background Information ***6***

A. Facility description **7**
History 7
Collection system status 7
Treatment processes 8
Solid wastes/Residual Solids 8
Discharge outfall 9

B. Description of the receiving waters **9**

C. Wastewater influent characterization **9**

D. Wastewater effluent characterization **10**

E. Reclaimed Water Characterization **11**

F. Summary of compliance with previous permit issued **12**

G. State environmental policy act (SEPA) compliance **12**

III. Proposed Permit Limits ***12***

A. Design criteria **13**

B. Technology-based effluent limits **14**
Municipal Wastewater Technology Based Limits 14
Reclaimed Water Based Limits 16

C. Surface water quality-based effluent limits **18**
Numerical criteria for the protection of aquatic life and recreation 18
Numerical criteria for the protection of human health 18
Narrative criteria 18
Antidegradation 19
Mixing zones 19

D. Designated uses and surface water quality criteria **20**

E. Water quality impairments **21**

F. Evaluation of surface water quality-based effluent limits for numeric criteria **21**
Reasonable Potential Analysis 23

G. Human health **23**

H. Sediment quality **24**

I. Whole effluent toxicity **24**

J. Groundwater quality limits **25**

K. Comparison of effluent limits with the previous permit issued on April 28, 2005 **26**

L. Comparison of reclaimed water limits with the previous permit issued on April 28, 2005 27

IV. Monitoring Requirements 29

A. Wastewater monitoring 29

B. Reclaimed Water Quality Monitoring 30

C. Lab accreditation 30

V. Other Permit Conditions 30

A. Reporting and record keeping 30

B. Prevention of facility overloading 31

C. Operation and maintenance 31

D. Pretreatment 31

Duty to enforce discharge prohibitions 31
Federal and state pretreatment program requirements 32
Routine identification and reporting of industrial users 32
Requirements for performing an industrial user survey 32

E. Solid wastes 33

F. General conditions 33

VI. Permit Issuance Procedures 33

A. Permit modifications 33

B. Proposed permit issuance 34

VII. References for Text and Appendices 35

Appendix A - Public Involvement Information 36

Appendix B - Your Right to Appeal 37

Appendix C - Glossary 38

Appendix D - Technical Calculations 46

Appendix E - Response to Comments 48

Appendix F – Process Schematic 49

Appendix G – 2012 West Medical Lake Memo 50

Table 1: General Facility Information 6

Table 2: Wastewater Influent – Characterization – City Influent 9

Table 3: Wastewater Influent Characterization – State Facility 10

Table 4: Wastewater Effluent Characterization – Surface Water Discharge 10

Table 5: Wastewater Effluent Characterization – Reclaimed Water Discharge to West Medical Lake 11

Table 6: Design Criteria for the City of Medical Lake 13

Table 7: Technology-Based Limits 14

Table 8: Technology-based Mass Limits 15

Table 9: Technology-based Mass Limits 15

Table 10: Class A Reclaimed Water Standards 17

Table 11: Freshwater Aquatic Life Uses and Associated Criteria 20

Table 12: Recreational Uses and Associated Criteria 20

Table 13: Comparison of Previous and Proposed Effluent Limits (April – November) 26

Table 14: Comparison of Previous and Proposed Effluent Limits (December – March) 27

Table 15: Comparison of Previous and Proposed Effluent Limits – Use Area #1 West Medical 27

Table 16: Comparison of Previous and Proposed Effluent Limits – Use Area #2 City Reclaimed Water System 28

Table 17: Accredited Parameters 30

Figure 1: Facility Location Map 7

I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to domestic wastewater NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC)
- Technical criteria for discharges from municipal wastewater treatment facilities (chapter 173-221 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for groundwaters (chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (chapter 173-205 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC)

These rules require any treatment facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See **Appendix A - Public** Involvement Information for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix E**.

II. Background Information

Table 1: General Facility Information

Facility Information	
Applicant	City of Medical Lake
Facility Name and Address	Water Reclamation Facility E. 207 Ellen Avenue Medical Lake, WA 99022
Contact at Facility	Name: Steve Cooper Telephone #: 509-299-6860
Responsible Official	Name: Doug Ross Title: Public Works Director Address: S 124 Lefevre, P.O. Box 369, Medical Lake, WA 99022 Telephone #: 509-754-4601 FAX # 509-299-7712
Type of Treatment	Activated Sludge with UV disinfection. Reclaimed water treatment includes coagulation, filtration, and chlorine disinfection.
Facility Location (NAD83/WGS84 reference datum)	Latitude: 47.5839510476078 Longitude: -117.682886915605
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Tributary to Deep Creek Latitude: 47.586111 Longitude: 117.684722
Use Area #1	West Medical Lake Latitude: 47.566667 Longitude: 117.7025
Use Area 2	City Reclaimed Water System

Permit Status	
Reauthorization Date of Previous Permit	April 28, 2005
Application for Permit Renewal Submittal Date	November 13, 2009
Date of Ecology Acceptance of Application	April 9, 2010

Inspection Status	
Date of Last Non-sampling Inspection Date	June 9, 2010

Figure 1: Facility Location Map

A. Facility description

History

The City of Medical Lake constructed their first treatment facility in 1963. Over the years, the treatment lagoons saw several upgrades. In June of 1995, Ecology approved a Facilities Plan Addendum that selected a sequencing batch reactor facility to replace the lagoon based treatment facility. Financing difficulties during the design process prevented the SBR facility from being completed. In 1998, Ecology approved a Second Addendum to the Facilities Plan which proposed the construction of an oxidation ditch adjacent to the existing lagoon treatment facility. This approved design included the polishing steps necessary to produce Class A Reclaimed Water. The new wastewater treatment and reclamation facility came online in 2001.

Collection system status

Gravity conveyance comprises the majority of the City of Medical Lake's collection system although there are three lift stations and short segments of force main that serve low lying areas.

Treatment processes

You can find basic information describing wastewater treatment processes included in a booklet at the Water Environment Federation website at:
http://www.wef.org/publicinformation/default.aspx

An extended aeration oxidation ditch activated sludge treatment facility treats a portion of flows received by the City of Medical Lake and DSHS facilities to Class A Reclaimed Water Standards prior to discharge to West Medical Lake. The remaining flow gets treated to state standards for Class A surface waters prior to discharge to a tributary of Deep Creek. A process flow diagram can be found in Appendix F.

An influent pump station receives raw wastewater from the City and the DSHS facilities where it is then pumped to the headworks building. Within the headworks building, the influent goes through screening and a degritting process. The City prevents odiferous headworks by covering influent channels and routing collected air through a scrubber before being released to the atmosphere. Following the headworks, wastewater then flows to the anaerobic basins in the Aeration Structure prior to entering the anoxic basins and the oxidation ditch. The anaerobic, anoxic and aeration basins provide secondary treatment and nutrient removal.

Following the sequencing aeration/anaerobic/anoxic secondary treatment processes, effluent routes to secondary clarifiers where flow can be split between the two clarifiers for a parallel flow pattern. Valves may also be configured to allow for series flow through the two secondary clarifiers, if needed. Clarified effluent flows to a filter pump station sump located within the Final Treatment Building. Flow splits between two final treatment trains. Class A effluent receives a dose of coagulant prior to entering the dual media sand filter and then routes to a UV disinfection chamber prior to being pumped via reclaimed water pumps to West Medical Lake or to the on-site irrigation system. The portion of wastewater not coagulated and filtered receives UV disinfection prior to discharging to the Deep Creek tributary. A small volume of disinfected wastewater will be pumped back to the treatment process by the utility water pump station. The treatment facility personnel use this water for wash-down water, chemical make-up/dilution water, and foam control sprays.

Solids from the secondary clarifiers settle to the bottom of the basins where Return Activated Sludge pumps cycle them back to the anaerobic/anoxic basins. Depending on the mixed liquor concentration, solids from the secondary clarifier may also be wasted, via waste activated sludge pumps, to an aerated sludge storage tank. Prior to dewatering via a belt filter press, biosolids mix with a polymer to facilitate removal of excess water. Once dewatered, biosolids convey to a truck which transports them to an off-site composting facility.

Solid wastes/Residual Solids

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the primary and secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. The City of Medical Lake drains grit, rags, scum, and screenings and disposes this solid waste at the local landfill.

Solids removed from the primary and secondary clarifier are treated in aerobic digesters and dewatered prior to being sent to Barr Tech for composting.

Discharge outfall

The treated and disinfected effluent flows into an intermittent tributary of Deep Creek through a 24-inch, single port, ductile iron pipe with invert elevation of 2406.1 msl. Class A reclaimed water discharges to either West Medical Lake via the reclaimed water distribution or provides irrigation water for the treatment facility.

B. Description of the receiving waters

The City of Medical Lake periodically discharges to a tributary of Deep Creek. Significant nearby non-point sources of pollutants include agricultural runoff. Groundwater wells provide drinking water for the City of Medical Lake. No drinking water intakes are up or downstream of the facility's outfall into the tributary of Deep Creek. Section IIE of this fact sheet describes any receiving waterbody impairments.

No ambient background data could be found for the intermittent tributary of Deep Creek. All effluent limits in this proposed permit should be met prior to discharge, following disinfection.

The City of Medical Lake periodically discharges Class A reclaimed water to West Medical Lake. West Medical Lake drains a two (2) square mile area. The lake has a surface area of 220 acres with a mean depth of 22 feet and a maximum depth of 35 feet. Section IIE of this fact sheet describes receiving waterbody impairments.

The ambient background data used for this permit includes the following from Washington State Department of Ecology's Publication No. 00-03-039, *'Water Quality Assessments of Selected Lakes within Washington State and a 2012 Updated Project Data Memo on West Medical Lake Verification Monitoring'*. See Appendix G for West Medical Lake Water Quality Data.

C. Wastewater influent characterization

The City of Medical Lake reported the concentration of influent pollutants in discharge monitoring reports. Two influent lines combine in the facility's influent pumping station. The influent wastewater from the City and the State Facility is characterized as follows:

Table 2: Wastewater Influent – Characterization – City Influent

Parameter	Units	# of Samples	Average Value	Maximum Value
Biochemical Oxygen Demand (BOD_5)	mg/L	**65**	**249**	**1,922**
Biochemical Oxygen Demand (BOD_5)	lbs/day	**12**	**836**	**1,785**
Total Suspended Solids (TSS)	mg/L	**65**	**274**	**1,661**

Parameter	Units	# of Samples	Average Value	Maximum Value
Total Suspended Solids (TSS)	lbs/day	**38**	**1,148**	**4,664**
TKN, as N	mg/L	**65**	**25.9**	**43**
Total Phosphorus	mg/L	**65**	**5.95**	**34.4**

Table 3: Wastewater Influent Characterization – State Facility

Parameter	Units	# of Samples	Average Value	Maximum Value
Biochemical Oxygen Demand (BOD_5)	mg/L	**65**	**224**	**547**
Total Suspended Solids (TSS)	mg/L	**65**	**188**	**592**
Flow	**MGD**	**65**	**.15**	**.94**

D. Wastewater effluent characterization

The City of Medical Lake reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The tabulated data represents the quality of the wastewater effluent discharged from January 2008 – May 2013. The wastewater effluent is characterized as follows:

Table 4: Wastewater Effluent Characterization – Surface Water Discharge

Parameter	Units	# of Samples	Average Value	Maximum Value
Flow	**MGD**	**65**	**0.26**	**1.44**
Biochemical Oxygen Demand (BOD_5)	mg/L	**65**	**2.1**	**4.9**
Biochemical Oxygen Demand (BOD_5)	lbs/day	**65**	**5.9**	**34.2**
Total Suspended Solids (TSS)	mg/L	**65**	**2.8**	**9.2**
Total Suspended Solids (TSS)	lbs/day	**65**	**8.7**	**48.9**
Ammonia	**mg/L**	**65**	**0.35**	**8.13**
Total Nitrogen	**mg/L**	**65**	**4.1**	**11.5**
Total Phosphorus	**mg/L**	**65**	**.27**	**1.1**

Parameter	Units	# of Samples	Maximum Monthly Geometric Mean	Maximum Weekly Geometric Mean
Fecal Coliforms	#/100 mL	65	.23	3.4

Parameter	Units	# of Samples	Minimum Value	Maximum Value
pH	standard units	**65**	**6.23**	**7.75**
Dissolved Oxygen	mg/L	**65**	**6.0**	**--**

E. Reclaimed Water Characterization

The City of Medical Lake reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The tabulated data represents the quality of the Class A reclaimed water discharged from January 2008 – May 2013. The reclaimed water is characterized as follows:

Table 5: Wastewater Effluent Characterization – Reclaimed Water Discharge to West Medical Lake

Parameter	Units	# of Samples	Average Value	Maximum Value
Flow – to W Medical Lake	mgd	**65**	**.281**	**.524**
Flow - to City Irrigation	mgd	**31**	**0.02**	**0.3**
Biochemical Oxygen Demand (BOD_5)	mg/L	**65**	**1.33**	**2.9**
Biochemical Oxygen Demand (BOD_5)	lbs/day	**65**	**3.8**	**8.4**
Total Suspended Solids (TSS)	mg/L	**65**	**0.12**	**1.3**
Total Suspended Solids (TSS)	lbs/day	**65**	**0.31**	**0.8**
Ammonia	mg/L	**65**	**0.19**	**8.84**
Total Nitrogen	mg/L	**65**	**3.85**	**11**
Total Phosphorus	mg/L	**65**	**0.08**	**0.14**

Parameter	Units	# of Samples	Maximum Monthly Geometric Mean	Maximum Weekly Geometric Mean
Total Coliforms	#/100 mL	65	3.04	0.1

Parameter	Units	# of Samples	Minimum Value	Maximum Value
pH	standard units	**65**	**6.54**	**7.74**
Turbidity	NTU	**65**	**0.15**	**1.01**
Dissolved Oxygen	mg/L	**65**	**6.55**	**--**

F. Summary of compliance with previous permit issued

The previous permit placed effluent limits on BOD, TSS, fecal coliform, dissolved oxygen, pH, flow, total nitrogen, total phosphorus and ammonia for discharge to the Deep Creek tributary. The facility also has Class A reclaimed water limits for discharge to West Medical Lake.

The City of Medical Lake has complied with the effluent limits and permit conditions throughout the duration of the permit issued on April 28, 2005. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs) and on inspections.

G. State environmental policy act (SEPA) compliance

State law exempts the issuance, reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions are no less stringent than federal and state rules and regulations (RCW 43.21C.0383). The exemption applies only to existing discharges, not to new discharges.

III. Proposed Permit Limits

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the National Toxics Rule (40 CFR 131.36).

- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)].

Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant in the facility plan dated January 6, 1998 and prepared by Esvelt Environmental Engineering, Inc. The table below includes design criteria from the referenced report.

Table 6: Design Criteria for the City of Medical Lake

Parameter	Design Quantity
Monthly Average Dry Weather Flow	1.04 MGD
Maximum Month Design Flow (MMDF)	1.85 MGD
Maximum Day Flow	4.10 MGD
Peak Instantaneous Design Flow (PIDF)	6.20 MGD**
BOD_5 Loading for Maximum Month	2,350 lbs/day
TSS Loading for Maximum Month	2,400 lbs/day
TKN Loading for Maximum Month	500 lbs/day**
Phosphorus Loading for Maximum Month	71 lbs/day**
** To be reported with annual wasteload assessment	

B. Technology-based effluent limits

Municipal Wastewater Technology Based Limits

Federal and state regulations define technology-based effluent limits for municipal wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for municipal wastewater.

The table below identifies technology-based limits for pH, fecal coliform, BOD_5, and TSS, as listed in chapter 173-221 WAC. Section III.F of b this fact sheet describes the potential for water quality-based limits.

Table 7: Technology-Based Limits

Parameter	Average Monthly Limit	Average Weekly Limit
BOD_5 (concentration)	30 mg/L	45 mg/L
BOD_5 (concentration)	In addition, the BOD_5 effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
TSS (concentration)	30 mg/L	45 mg/L
TSS (concentration)	In addition, the TSS effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	

Parameter	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria	200 organisms/100 mL	400 organisms/100 mL

Parameter	Daily Minimum	Daily Maximum
pH	6.0 standard units	9.0 standard units

Technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b). Ecology calculated the monthly and weekly average mass limits for BOD_5 and Total Suspended Solids as follows:

Mass Limit = CL x DF x CF

where:

CL = Technology-based concentration limits listed in the above table

DF = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

Table 8: Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD_5 Monthly Average	30	462.9
BOD_5 Weekly Average	45	694.3
TSS Monthly Average	30	462.9
TSS Weekly Average	45	694.3

Technology-based mass limits are based on WAC 173-220-130(3)(b), WAC 173-221-030(11)(b), WAC 173-220-130(1)(a) and (g), and WAC 173-221-040(1). Ecology calculated the monthly and weekly average mass limits for BOD_5 and Total Suspended Solids as follows:

Average Monthly Mass Effluent Limit = Influent Mass Design Loading Criteria (lb/day) x 0.15

Average Weekly Mass Effluent Limit = 1.5 x Average Monthly Mass Effluent TSS Limit

Table 9: Technology-based Mass Limits

Parameter	Influent Loading (lbs/day)	Mass Limit (lbs/day)
BOD_5 Monthly Average	2,350	352.5
BOD_5 Weekly Average	-	528.8
TSS Monthly Average	2,400	360
TSS Weekly Average	-	540

BOD and TSS limits in this proposed permit will not be altered from permit limits previously issued. Previous effluent limits for BOD and TSS (15 mg/L and 23 mg/L), based off of Ecology's guidance for water quality standards in intermittent streams, have sufficiently protected receiving water quality, are more conservative than technology based limits, and can be easily achieved by the facility. The less stringent technology based limits will not be issued during this permit cycle to prevent backsliding.

Reclaimed Water Based Limits

All reclaimed water permits must assure that the effluent has been adequately and reliably treated so, as a result of that treatment, it becomes suitable for a beneficial use or a controlled use that would not otherwise occur. Because of this treatment, reclaimed water should no longer be considered a wastewater (RCW 90.46.010(40)). The authority and duties for reclaimed water use include those already provided in law with regard to sewage and wastewater collection, treatment, and disposal for the protection of public health and the safety of state waters.

The *Water Reclamation and Reuse Standards* outline the requirements for the additional level of treatment technology as well as water quality limits necessary for public health protection during the use of reclaimed water. The standards provide four classes of reclaimed water, Classes A, B, C, and D.

The City of Medical Lake produces Class A reclaimed water. Class A, the highest quality reclaimed water, provides for the broadest range of reuse opportunities. Class A reclaimed water requires the most stringent treatment and water quality limits. The technology and water quality requirements for the production of Class A reclaimed follow:

"Class A Reclaimed Water" is reclaimed water that has been adequately and reliably treated and, at a minimum is, at all times, an oxidized, coagulated, filtered, and disinfected wastewater.

1. Oxidized is defined as wastewater in which the organic matter has been stabilized such that BOD_5 does not exceed 30 mg/L and TSS does not exceed 30 mg/L, is non-putrescible, and contains dissolved oxygen.

2. Coagulated wastewater is defined as an oxidized wastewater in which colloidal and finely divided suspended matter have been destabilized and agglomerated prior to filtration by the addition of chemicals or by an equally effective method.

3. Filtered wastewater is defined as an oxidized, coagulated wastewater that has been passed through natural undisturbed soils or filter media, such as sand or anthracite, so that the turbidity, as determined by an approved laboratory method, does not exceed an average value of 2 Nephelometric turbidity units (NTU), determined monthly, and does not exceed 5 NTU at any time.

4. Adequate disinfection is defined as the median number of total coliform organisms in the wastewater after disinfection does not exceed 2.2 per 100 milliliters, as determined from the bacteriological results of the last seven (7) days for which analyses have been completed, and the number of total coliform organisms does not exceed 23 per 100 milliliters in any sample.

Table 11 presents the Class A reclaimed water standards that apply to Medical Lake's facility.

Table 10: Class A Reclaimed Water Standards

Oxidized Wastewater – Secondary Effluent [c]		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
BOD_5	30 mg/L	45 mg/L
TSS	30 mg/L	45 mg/L
Dissolved Oxygen	Must be measurably present in secondary effluent at all times	
Coagulated/Filtered Wastewater – Prior to Disinfection		
Turbidity	**Average Monthly [a]** 2 NTU	**Sample Maximum [d]** 5 NTU
Disinfected Reclaimed Water		
Total Nitrogen (as N)	**Average Monthly [a]** 10 mg/L	**Sample Maximum [d]** 15 mg/L
Total Coliform Bacteria	**7-day Median [e]** 2.2 MPN/ 100 ml	**Sample Maximum [f]** 23 MPN/100 ml
pH	**Daily Minimum** 6.0	**Daily Maximum** 9.0
Distribution System		
Chlorine Residual	**Minimum Daily** 0.5 mg/L	Point of compliance [g]

a	The average monthly value for compliance is calculated as the sum of all daily samples measured during a calendar month divided by the number of sample measured that month
b	The average weekly value for compliance is calculated as the sum of all daily samples measured during a calendar week divided by the number of daily samples measured during that week.
c	The compliance point for BOD_5 and TSS is the secondary effluent.
d	The sample maximum is defined as the value not to be exceeded by any single sample.
e	The median number of total coliform organisms in the reclaimed water after disinfection is determined from the bacteriological results of the last 7 days of analyses.
f	This limit denotes the maximum number of total coliform organisms per 100 milliliters allowable in any single sample.
g	A chlorine residual of at least 0.5 mg/L shall be maintained in the reclaimed water during conveyance to the location of use.

The monthly effluent mass BOD_5 limit, based on an effluent concentration of 30 mg/L and the maximum month design flow of 1.85 MGD, would be 462.9 lb/d. The weekly average effluent mass loading rate limit is equal to 1.5 of the monthly loading rate limit. So, for a monthly BOD_5 loading rate of 462.9 lb/d, the weekly average BOD_5 loading rate limit is 694.3 lb/day.

However, the facility can easily achieve a monthly secondary effluent BOD limit of 10 mg/L resulting in a loading of 154.3 lbs/day. The weekly average secondary effluent BOD limit of 15 mg/L results in a weekly average loading rate of 231.4 lb/day.

These BOD_5 limits are more stringent than those derived from the technology based effluent limits in Table 12, avoid backsliding with less stringent limits and have therefore been applied in this proposed permit.

Although the *Water Reclamation and Reuse Standards* require Class A water to have a chlorine residual of at least 0.5 mg/L at the point of distribution, The City of Medical Lake has historically not maintained a chlorine residual in its reclaimed water supply. This permit requires the facility to maintain a chlorine residual in the reclaimed water distribution system.

C. Surface water quality-based effluent limits

The Washington State surface water quality standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical criteria for the protection of human health

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA, 1992). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

Description - The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility Specific Requirements - This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.
- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.

Ecology’s analysis described in this section of the fact sheet demonstrates that the proposed permit conditions will protect existing and designated uses of the receiving water.

Mixing zones

No receiving water body information could be obtained for the intermittent tributary to Deep Creek. No mixing zone will be authorized for this proposed permit. Limits are based upon guidance for water quality standards in intermittent streams.

D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). The tables included below summarize the criteria applicable to the receiving water's designated uses.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified below.

Table 11: Freshwater Aquatic Life Uses and Associated Criteria

Salmonid Spawning, Rearing, and Migration	
Temperature Criteria – Highest 7-DAD MAX	17.5°C (63.5°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	8.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas must not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	The pH must measure within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- The *recreational uses* for this receiving water are identified below.

Table 12: Recreational Uses and Associated Criteria

Recreational Use	Criteria
Extraordinary Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.

- The *water supply uses* are domestic, agricultural, industrial, and stock watering.
- The *miscellaneous freshwater uses* are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

E. Water quality impairments

Ecology has not documented any water quality impairments in the receiving water in the vicinity of the outfall into the tributary to Deep Creek. .

West Medical Lake is listed on the current 303(d) and is impaired for several parameters. Category 5 listings include bacteria, ammonia, PCB, and 2,3,7,8-TCDD. Ecology recently completed a water quality analysis for West Medical Lake which included data collection for several parameters including phosphorus and nitrogen species. Results of that study include maintaining the current Category 2 listing for phosphorus and a new Category 2 listing for nitrogen.

The Washington Department of Fish and Wildlife consider West Medical Lake a highly managed sport fishery. No water quality complaints have been received by Ecology or WDFW in recent years. West Medical Lake has been nitrogen-limited for 40 years; however, no indication exists that nitrogen impairs designated uses.

Several studies (1974, 1994, 2012) indicate that while phosphorus levels are high within West Medical Lake, no designated uses are impaired. However, if the phosphorus to nitrogen ration changes significantly, the high phosphorus levels may become a concern.

F. Evaluation of surface water quality-based effluent limits for numeric criteria

Ecology has not authorized a mixing zone in the permit for the discharge into the intermittent tributary of Deep Creek.

Nutrients - The proposed permit includes effluent limits for total nitrogen and phosphorus based upon anticipated performance information provided in the 1998 Facilities Plan.

Dissolved Oxygen--BOD_5 and Ammonia Effects - Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water. Criteria listed in the guidance for water quality based standards for discharges to intermittent streams details limits for BOD_5 and ammonia. Due to no available receiving water body information, this permit uses the criteria listed in the Ecology guidance document for BOD_5 and ammonia limits.

pH - Ecology predicts no violation of the pH criteria under critical conditions. The proposed permit includes performance based effluent limits for pH of a pH range of 6.0 to 7.5.

Fecal Coliform - The Medical Lake WWTP has demonstrated it can reliably meet the water quality standard for fecal coliforms for primary contact recreation in the discharge. Therefore, the proposed permit includes the primary contact recreation standard for fecal coliform as a performance-based (technology-based) effluent limit for fecal coliform bacteria.

Turbidity - Ecology evaluated the impact of turbidity based on the range of total suspended solids in the effluent and turbidity of the receiving water. Ecology expects no violations of the turbidity criteria provided the facility meets its technology-based total suspended solids permit limits.

Toxic Pollutants - Federal regulations (40 CFR 122.44) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

The following toxic pollutants are present in the discharge: ammonia. A reasonable potential analysis could not be performed as no receiving water data can be collected. Ecology's guidance for water quality based standards for discharges to intermittent streams details ammonia limits for discharge to the receiving water body.

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. Average monthly ammonia limits of 1.0 mg/L will be applied to this permit, as set forth in Ecology's guidance for water quality based standards for discharges to intermittent streams.

Temperature - The state temperature standards [WAC 173-201A-200-210 and 600-612] include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

- Annual summer maximum and supplementary spawning/rearing criteria

  Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1)(c), 210(1)(c), and Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

  Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.

  The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax). The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

- Incremental warming criteria

  The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

  At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

  At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3°C above the naturally warm condition.

  When Ecology has not yet completed a TMDL, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- Protections for temperature acute effects

  Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C, unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.

  General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.

  Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

Reasonable Potential Analysis

Ecology does not have sufficient information on the temperature of the effluent or the receiving water to determine compliance with water quality criteria for temperature. The intermittent nature of the receiving water body creates an impossible scenario for receiving water monitoring. No receiving water temperature study will be required for this permit cycle. Rather, the facility must meet temperature criteria listed in Table 14 of this proposed permit during the months of April – November.

G. Human health

Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology determined the applicant's discharge is unlikely to contain chemicals regulated to protect human health. Ecology will reevaluate this discharge for impacts to human health at the next permit reissuance.

H. Sediment quality

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website. http://www.ecy.wa.gov/programs/tcp/smu/sediment.html.

Through a review of the discharger characteristics and of the effluent characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards.

I. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

- *Acute toxicity tests measure mortality as the significant response* to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.
- *Chronic toxicity tests measure various sublethal toxic responses*, such as reduced growth or reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate an NOEC, LC50, EC50, IC25, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (https://fortress.wa.gov/ecy/publications/SummaryPages/9580.html), which is referenced in the permit. Ecology recommends that The Medical Lake WWTP send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water acute toxicity. The proposed permit will not include an acute WET limit. The Medical Lake WWTP must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization. The Medical Lake WWTP may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing and/or chemical analyses after the process or material changes have been made. Ecology recommends that the Permittee check with it first to make sure that Ecology will consider the demonstration adequate to support a decision to not require an additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased.

WET testing conducted during effluent characterization showed a slight probability for effluent discharges to cause receiving water chronic toxicity. The proposed permit will not include a chronic WET limit; however, The Medical Lake must retest the effluent before submitting an application for permit renewal. The results of these effluent tests will be used during the next permit cycle for a reasonable potential determination and possible development of a chronic limit.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. The Medical Lake WWTP may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

J. Groundwater quality limits

The groundwater quality standards (chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).

The City of Medical Lake does not discharge wastewater to the ground. No permit limits are required to protect groundwater.

K. Comparison of effluent limits with the previous permit issued on April 28, 2005

Table 13: Comparison of Previous and Proposed Effluent Limits (April – November)

		Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand (5-day)	WQ	15 mg/L	23 mg/L	15 mg/L	23 mg/L
Biochemical Oxygen Demand (5-day)	WQ	--	--	231 lbs/day	346 lbs/day
Total Suspended Solids	WQ	15 mg/L	23 mg/L	15 mg/L	23 mg/L
Total Suspended Solids	WQ	--	--	231 lbs/day	346 lbs/day

Parameter		**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**
Fecal Coliform Bacteria	WQ	50/100 mL	100/100 mL	50/100 mL	100/100 mL

Parameter		**Limit**	**Limit**
pH	Performance	6.0-7.75	6.0-7.75

Parameter		**Minimum**	**Maximum**	**Minimum**	**Maximum**
Flow	WQ	0.1 MGD	--	0.1 MGD	--
Dissolved Oxygen	WQ	6.0 mg/L	--	8.0 mg/L	
Total Nitrogen, as N	WQ		10 mg/L [a]		10 mg/L [a]
Total Phosphorus, as P	WQ	85% Removal [b]		85% Removal [b]	
[a] Seasonal average during discharge					
[b] Minimum monthly average removal					

Parameter		**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Ammonia Nitrogen (as NH_3 – N)	Performance	1.0 mg/L	3.0 mg/L		

Table 14: Comparison of Previous and Proposed Effluent Limits (December – March)

		Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand (5-day)	WQ	15 mg/L	23 mg/L	15 mg/L	23 mg/L
Biochemical Oxygen Demand (5-day)	WQ	231 lbs/day	346 lbs/day	231 lbs/day	346 lbs/day
Total Suspended Solids	WQ	15 mg/L	23 mg/L	15 mg/L	23 mg/L
Total Suspended Solids	WQ	231 lbs/day	346 lbs/day	231 lbs/day	346 lbs/day
Ammonia Nitrogen (as NH_3 – N)	WQ	2.0 mg/L	--	2.0 mg/L	--

Parameter		**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**
Fecal Coliform Bacteria	Technology	100/100 mL	200/100 mL	100/100 mL	200/100 mL

Parameter		**Limit**	**Limit**
pH	Technology	6.0-7.75	6.0-7.75

Parameter		**Minimum**	**Maximum**	**Minimum**	**Maximum**
Dissolved Oxygen	WQ	6.0 mg/L	--	8.0 mg/L	
Total Nitrogen, as N	WQ		10 mg/L [a]		10 mg/L [a]
[a] Seasonal average during discharge					

L. Comparison of reclaimed water limits with the previous permit issued on April 28, 2005

Table 15: Comparison of Previous and Proposed Effluent Limits – Use Area #1 West Medical

Secondary Effluent					
		Previous Effluent Limits: Outfalls # 002/003		**Proposed Effluent Limits: Outfall # 002/003**	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand (5-day) [a]	Technology	10 mg/L	15 mg/L	10 mg/L	15 mg/L
Total Suspended Solids	Technology	10 mg/L	15 mg/L	10 mg/L	15 mg/L

Coagulated/Filtered Wastewater – Prior to Disinfection					
Parameter		**Average Monthly**	**Sample Maximum**	**Average Monthly**	**Sample Maximum**
Turbidity	Technology	2 NTU	5 NTU	2 NTU	5 NTU

Parameter		Limit	Limit
pH	Performance	6.0-7.75	6.0-7.75

Disinfected – Reclaimed Water					
Parameter		**Average Monthly**	**Sample Maximum**	**Average Monthly**	**Sample Maximum**
Total Nitrogen as N	Technology	10 mg/L	15 mg/L	10 mg/L	15 mg/L
Total Phosphorus as P	Technology	0.5 mg/L	1.0 mg/L	0.5 mg/L	1.0 mg/L
Total Ammonia (as NH_3 –N)	Technology	1.0 mg/L	3.0 mg/L	1.0 mg/L	3.0 mg/L
Parameter		**Minimum**	**Maximum**	**Minimum**	**Maximum**
Dissolved Oxygen	Technology	6.0 mg/L	--	8.5	--
Parameter		**7-day Median**	**Sample Maximum**	**Minimum**	**Maximum**
Total Coliform	Technology	2.2/100 mL	23/100 mL	2.2/100 mL	23/100 mL

Table 16: Comparison of Previous and Proposed Effluent Limits – Use Area #2 City Reclaimed Water System

Secondary Effluent					
		Previous Effluent Limits: Outfalls # 002/003		**Proposed Effluent Limits: Outfall # 002/003**	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand (5-day) [a]	Technology	10 mg/L	15 mg/L	10 mg/L	15 mg/L
Biochemical Oxygen Demand (5-day) [a]	Technology	154 lbs/day	231 lbs/day		
Total Suspended Solids	Technology	10 mg/L	15 mg/L	10 mg/L	15 mg/L
Total Suspended Solids	Technology	154 lbs/day	231 lbs/day		
Dissolved Oxygen	Technology	Measurably Present at All Times		Measurably Present at All Times	

Coagulated/Filtered Wastewater – Prior to Disinfection					
Parameter		**Average Monthly**	**Sample Maximum**	**Average Monthly**	**Sample Maximum**
Turbidity	Technology	2 NTU	5 NTU	2 NTU	5 NTU
Parameter		**Limit**		**Limit**	
pH	Technology	6.0-7.75		6.0-7.75	

Disinfected – Reclaimed Water					
Parameter		**Minimum Daily**	**Maximum Daily**	**Minimum Daily**	**Maximum Daily**
Chlorine residual	Technology	-	-	0.5 mg/L	--

Disinfected – Reclaimed Water					
Parameter		**Minimum Daily**	**Maximum Daily**	**Minimum Daily**	**Maximum Daily**
Parameter		**Average Monthly**	**Sample Maximum**	**Average Monthly**	**Sample Maximum**
Total Nitrogen as N	Technology	10 mg/L	15 mg/L	10 mg/L	15 mg/L
Total Phosphorus as P	Technology	0.5 mg/L	1.0 mg/L	0.5 mg/L	1.0 mg/L
Parameter		**7-day Median**	**Sample Maximum**	**Minimum**	**Maximum**
Total Coliform	Technology	2.2/100 mL	23/100 mL	2.2/100 mL	23/100 mL

IV. Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects.

When a facility uses an alternative method as allowed by the permit, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

A. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-09) for oxidation ditches.

Ecology has included some additional monitoring of nutrients in the proposed permit to establish a baseline for this discharger. It will use this data in the future as it develops TMDLs for dissolved oxygen and establishes WLAs for nutrients.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Biosolids monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503.

B. Reclaimed Water Quality Monitoring

The monitoring schedule can be found in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* for a Class A Reclaimed Water Plant.

C. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters). Ecology accredited the laboratory at this facility for:

Table 17: Accredited Parameters

General Chemistry		
Parameter Name	**Method Description**	**Matrix**
Ammonia	SM 4500-NH3 D-97	Non-Potable Water
Biochemical Oxygen Demand	SM 5210 B-01	Non-Potable Water
Dissolved Oxygen	SM 4500-O G-01	Non-Potable Water
Nitrate	SM 4500 NO3 D-00	Non-Potable Water
pH	SM 4500-H+ B-00	Non-Potable Water
Phosphorus, Total	SM 4500-P E-99	Non-Potable Water
Solids, Total Suspended	SM 2540 D-97	Non-Potable Water
Turbidity	SM 2130 B-01	Non-Potable Water
Fecal coliform – count	SM -22 D (M-FC)-97	Non-Potable Water
Total Coliform – count	SM 9222 B (M-endo)-97	Non-Potable Water

V. Other Permit Conditions

A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

B. Prevention of facility overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require The City of Medical Lake to:

- Take the actions detailed in proposed permit Special Condition S.4.
- Design and construct expansions or modifications before the treatment plant reaches existing capacity.
- Report and correct conditions that could result in new or increased discharges of pollutants.

Special Condition S.4 restricts the amount of flow.

C. Operation and maintenance

The proposed permit contains Special Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, chapter 173-230 WAC, and WAC 173-240-080. Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that The City of Medical Lake takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

D. Pretreatment

Duty to enforce discharge prohibitions

This provision prohibits the publicly owned treatment works (POTW) from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer.

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes "pass-through" or "interference". This general prohibition is from 40 CFR §403.5(a). **Appendix C** of this fact sheet defines these terms.
- The second section reinforces a number of specific state and federal pretreatment prohibitions found in WAC 173-216-060 and 40 CFR §403.5(b). These reinforce that the POTW may not accept certain wastes, which:
    a. Are prohibited due to dangerous waste rules.
    b. Are explosive or flammable.
    c. Have too high or low of a pH (too corrosive, acidic or basic).
    d. May cause a blockage such as grease, sand, rocks, or viscous materials.
    e. Are hot enough to cause a problem.
    f. Are of sufficient strength or volume to interfere with treatment.
    g. Contain too much petroleum-based oils, mineral oil, or cutting fluid.
    h. Create noxious or toxic gases at any point.

40 CFR Part 403 contains the regulatory basis for these prohibitions, with the exception of the pH provisions which are based on WAC 173-216-060.

- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology. These discharges include:
  a. Cooling water in significant volumes.
  b. Stormwater and other direct inflow sources.
  c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Federal and state pretreatment program requirements

Ecology administers the Pretreatment Program under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986) and 40 CFR, part 403. Under this delegation of authority, Ecology issues wastewater discharge permits for significant industrial users (SIUs) discharging to POTWs which have not been delegated authority to issue wastewater discharge permits. Ecology must approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) [40 CFR 403.8 (f)(1)(i) and(iii)].

Industrial dischargers must obtain a permit from Ecology before discharging waste to the The City of Medical Lake WWTP [WAC 173-216-110(5)]. Industries discharging wastewater that is similar in character to domestic wastewater do not require a permit.

Routine identification and reporting of industrial users

The permit requires non-delegated POTWs to take "continuous, routine measures to identify all existing, new, and proposed significant industrial users (SIUs) and potential significant industrial users (PSIUs)" discharging to their sewer system. Examples of such routine measures include regular review of water and sewer billing records, business license and building permit applications, advertisements, and personal reconnaissance. System maintenance personnel should be trained on what to look for so they can identify and report new industrial dischargers in the course of performing their jobs. The POTW may not allow SIUs to discharge prior to receiving a permit, and must notify all industrial dischargers (significant or not) in writing of their responsibility to apply for a State Waste Discharge Permit. The POTW must send a copy of this notification to Ecology.

Requirements for performing an industrial user survey

This POTW has the potential to serve significant industrial or commercial users and must conduct an industrial user (IU) survey. The purpose of the IU Survey is to identify all facilities that may be subject to pretreatment standards or requirements so that Ecology can take appropriate measures to control these discharges. The POTW should identify each such user, and require them to apply for a permit before allowing their discharge to the POTW to commence. For SIUs, the POTW must require they actually are issued a permit prior to accepting their discharge. The steps the POTW must document in their IU Survey submittal include:

1. The POTW must develop a master list of businesses that may be subject to pretreatment standards and requirements and show their disposition. This list must be based on several sources of information including business licenses, and water and sewer billing records.

2. The POTW must canvas all the potential sources, having them either complete a survey form or ruling them out by confirming they only generate domestic wastewater.
3. The POTW must develop a list of the SIUs and potential SIUs in all areas served by the POTW. The list must contain sufficient information on each to allow Ecology to decide which discharges merit further controls such as a state waste discharge permit.

Ecology describes the information needed in IU Survey submittals to allow Ecology to make permitting decision in the manual "Performing an Industrial User Survey". Properly completing an Industrial User Survey helps Ecology control discharges that may otherwise harm the POTW including its collection system, processes, and receiving waters. Where surveys are incomplete, Ecology may take such enforcement as appropriate and/or require the POTW to develop a fully delegated pretreatment program.

The proposed permit requires The City of Medical Lake to conduct an industrial user survey to determine the extent of compliance of all industrial users of the sanitary sewer and wastewater treatment facility with federal pretreatment regulations [40 CFR Part 403 and Sections 307(b) and 308 of the Clean Water Act)], with state regulations (chapter 90.48 RCW and chapter 173-216 WAC), and with local ordinances.

E. Solid wastes

To prevent water quality problems the facility is required in permit Special Condition S7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and state water quality standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under chapter 70.95J RCW, chapter 173-308 WAC "Biosolids Management," and chapter 173-350 WAC "Solid Waste Handling Standards." The disposal of other solid waste is under the jurisdiction of the Spokane County Health Department.

Requirements for monitoring sewage sludge and record keeping are included in this permit. Ecology will use this information, required under 40 CFR 503, to develop or update local limits.

F. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual domestic wastewater NPDES permits issued by Ecology.

VI. Permit Issuance Procedures

A. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwaters, based on new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed permit issuance

This proposed permit meets all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.

1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.

1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook.* USEPA Office of Water, Washington, D.C.

Esvelt Engineering, Inc.

1998. *City of Medical Lake Facilities Plan, Second Addendum.*

2002. *City of Medical Lake Wastewater and Reuse Operations and Maintenance Manual.*

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

2000. *Water Quality Assessments of Selected Lakes within Washington State: 1998.* Publication Number 00-03-039.

December 2011. *Permit Writer's Manual*. Publication Number 92-109 (https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html)

Laws and Regulations (http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information (http://www.ecy.wa.gov/programs/wq/permits/guidance.html)

Water Pollution Control Federation.

1976. *Chlorination of Wastewater*.

Wright, R.M., and A.J. McDonnell.

1979. *In-stream Deoxygenation Rate Prediction.* Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

Appendix A - Public Involvement Information

Ecology proposes to reissue a permit to the City of Medical Lake. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on May 20, 2014 in the Spokesman Review to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft permit and fact sheet are available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Asks people to tell us how well the proposed permit would protect the receiving water.
- Invites people to suggest fairer conditions, limits, and requirements for the permit.
- Invites comments on Ecology's determination of compliance with antidegradation rules.
- Urges people to submit their comments, in writing, before the end of the comment period.
- Tells how to request a public hearing about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting,* which is available on our website at https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html.

You may obtain further information from Ecology by telephone at (509) 329-3519 or by writing to the address listed below.

Ms. Ellie Key, P.E.
Water Quality Program
Department of Ecology
Eastern Regional Office
4601 North Monroe Street
Spokane, WA 99205-1295

The primary author of this permit and fact sheet is Ellie Key, P.E.

Appendix B - Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Appendix C - Glossary

1-DMax or 1-day maximum temperature -- The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures -- The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity --The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality -- The existing environmental condition of the water in a receiving water body.

Ammonia -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF) -- average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit -- The average of the measured values obtained over a calendar months time taking into account zero discharge days.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards -- National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity -- The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample -- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity -- Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

Critical condition -- The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt – This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample -- A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits -- Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility -- A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) -- See Method Detection Level.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone -- An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH -- The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through -- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) -- A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).
Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration

standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures.

The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1,2,or 5) x 10^n, where n is an integer. (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Significant industrial user (SIU) --

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge -- Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3,or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD_5 -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

State waters -- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit -- A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria -- A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids--That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) -- A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna.

Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee.

An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D - Technical Calculations

Note: Include spreadsheets, calculations, background assumptions, and other technical information that support the decisions and limits presented in the permit and fact sheet. The PWG is revising TSDcalc and merging it with PWspread to include all of the necessary permit spreadsheet tools in one place. Once merged, Nancy will need to modify some of the language below to reflect the new tools. The sections below with red headers are optional.

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on Ecology's homepage at http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.html.

Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The predicted concentration at the edge of a mixing zone (MC) is based on the following calculation:

$$MC = [EC + (AC \times DF)]/(1 + DF)$$

where:

EC = Effluent Concentration

AC = Ambient Concentration

DF = Dilution Factor

Reasonable Potential Analysis:

The spreadsheets REASPOT.XLS, and LIMIT.XLS in Ecology's TSDCALC Workbook determine reasonable potential (to violate the aquatic life water quality standards) and calculate effluent limits. The spreadsheet HUMAN-H.XLS determines reasonable potential and calculates effluent limits for human health pollutants. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Calculation of Water Quality-Based Effluent Limits:

Water quality-based effluent limits are calculated by the two-value wasteload allocation process as described on page 100 of the TSD (EPA, 1991) and shown below.

1. Calculate the acute wasteload allocation WLA_a by multiplying the acute criteria by the acute dilution factor and subtracting the background factor. Calculate the chronic wasteload allocation (WLA_c) by multiplying the chronic criteria by the chronic dilution factor and subtracting the background factor.

   WLA_a = (acute criteria x DF_a) – [(background conc.x (DF_a - 1)]

   WLA_c = (chronic criteria x DF_c) – [(background conc. x (DF_c -1)]

   where: DF_a = Acute Dilution Factor

   DF_c = Chronic Dilution Factor

2. Calculate the long term averages (LTA_a and LTA_c) which will comply with the wasteload allocations WLA_a and WLA_c.

   $LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$ where: $\sigma^2 = \ln[CV^2 + 1]$

   $z = 2.326$

   CV = coefficient of variation = std. dev./mean

   $LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$ where: $\sigma^2 = \ln[(CV^2 \div 4) + 1]$

   $z = 2.326$

3. Use the smallest LTA of the LTA_a or LTA_c to calculate the maximum daily effluent limit and the monthly average effluent limit.

   Maximum Daily Limit = MDL

   $MDL = LTA x e^{(Z\sigma - 0.5\sigma^2)}$ where: $\sigma^2 = \ln[CV^2 + 1]$

   $z = 2.326$ (99th percentile occurrence

   LTA = Limiting long term average

   Average Monthly Limit = AML

   $AML = LTA x\ e^{(Z\sigma_n - 0.5\sigma_n^2)}$ where: $\sigma^2 = \ln[(CV^2 \div n) + 1]$

   n = number of samples/month

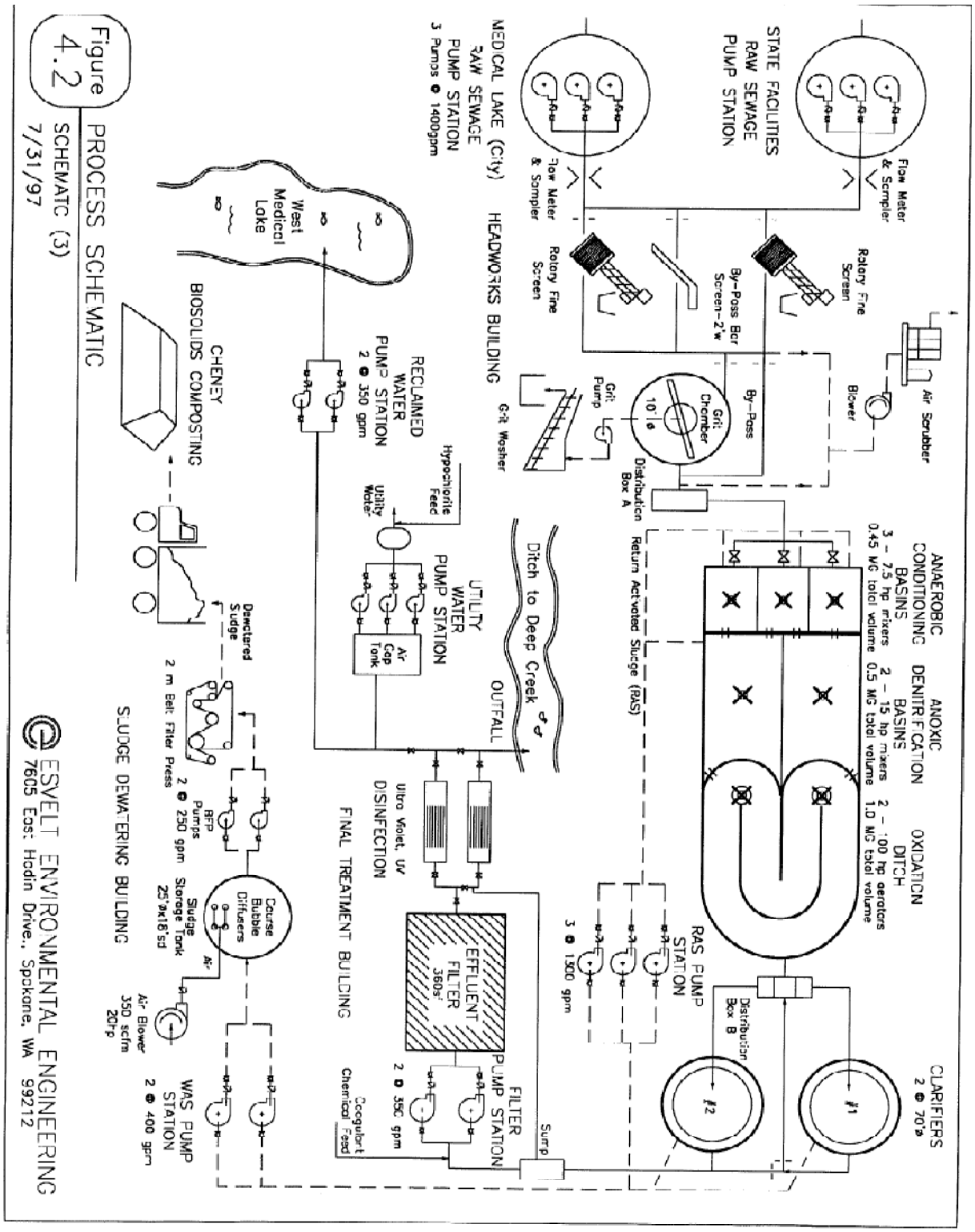
   $z = 1.645$ (95^{th} % occurrence probability)

   LTA = Limiting long term average

Appendix E - Response to Comments

Ecology received comments on the draft documents during the 30-day public comment period. The comments, Ecology's responses and the original comment documents are attached to this fact sheet as attachment E-1.

Appendix F – Process Schematic



Appendix G – 2012 West Medical Lake Memo

February 22, 2012

TO: Elaine Snouwaert (WQ-ERO)
Dave Knight (WQ-ERO)
James Bellatty (WQ-ERO)

THROUGH: Thomas Mackie (EAP-CRO)

FROM: Tighe Stuart (EAP-ERO)

SUBJECT: Updated Project Data Memo: West Medical Lake Verification Monitoring

Background/Purpose of Study

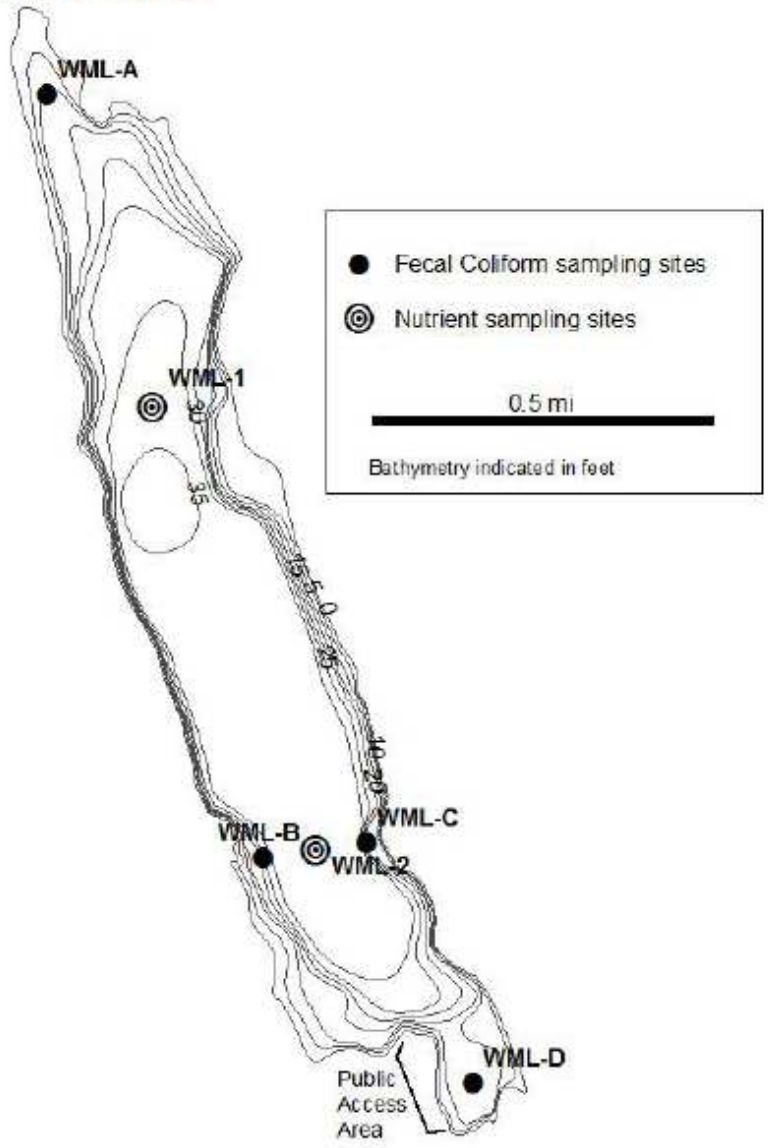
Data collected by Ecology in 1992 resulted in West Medical Lake being included on the 303(d) list for ammonia and fecal coliform. Additionally, Ecology observed very high nutrient levels and hypolimnetic anoxia in 1992 and again in 1998. Two wastewater treatment plants (WWTPs) which previously discharged to West Medical Lake stopped discharging in 2000.

The goals of this project were to:

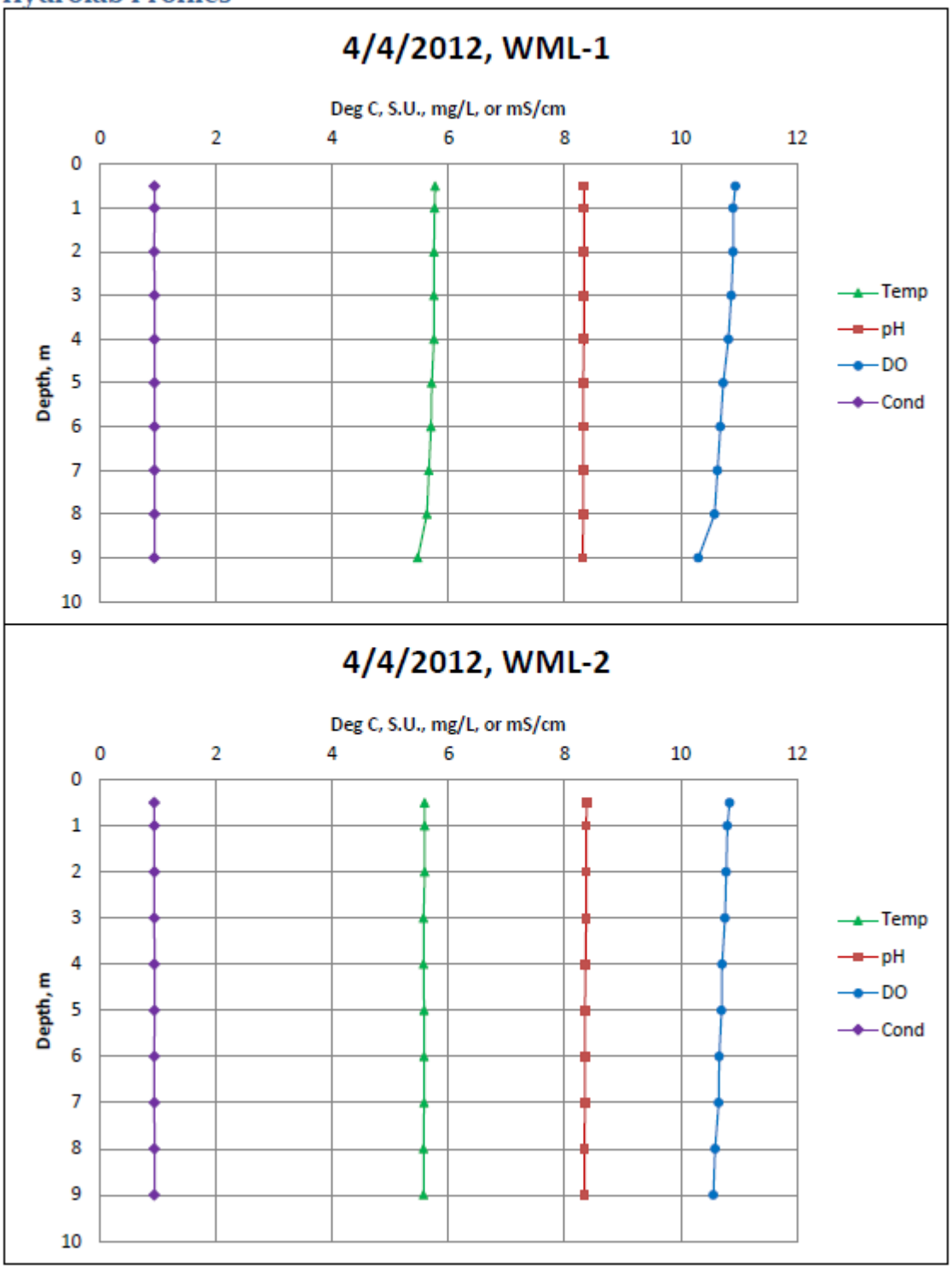
- Assess the nutrient and fecal coliform status of West Medical Lake after the removal of Eastern State Hospital and Lakeland Village wastewater discharges from the lake.
- Collect enough data to either confirm that ammonia and fecal coliform are still in violation of water quality standards or determine if delisting the lake for these parameters is appropriate.
- Determine whether total nitrogen concentrations are in compliance with the recommended total nitrogen standard for West Medical Lake.

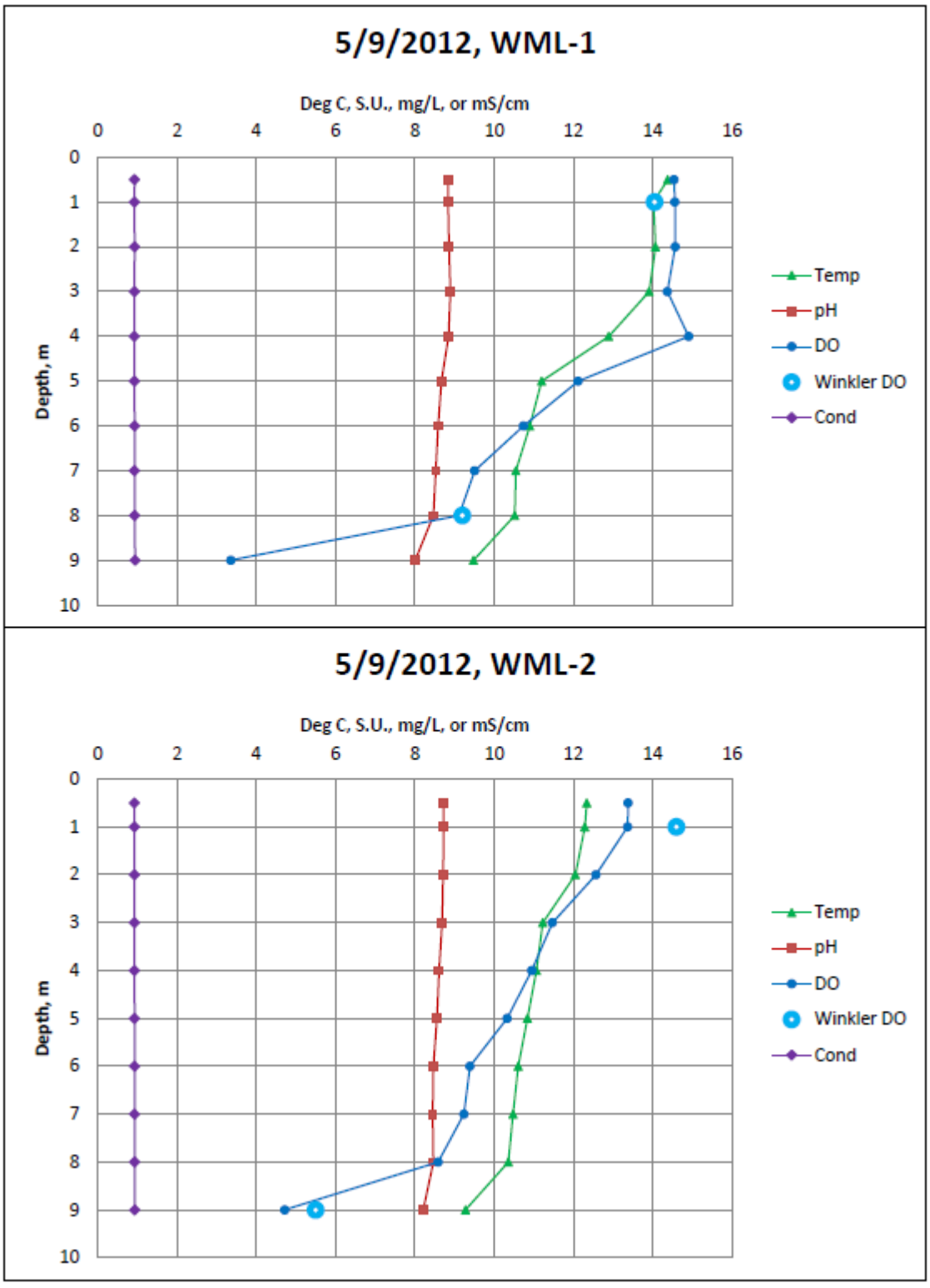
A Quality Assurance Project Plan was written (Stuart, 2012) which describes the study design, methods, and data quality procedures in detail. Data was collected as described in the QAPP without any significant changes.

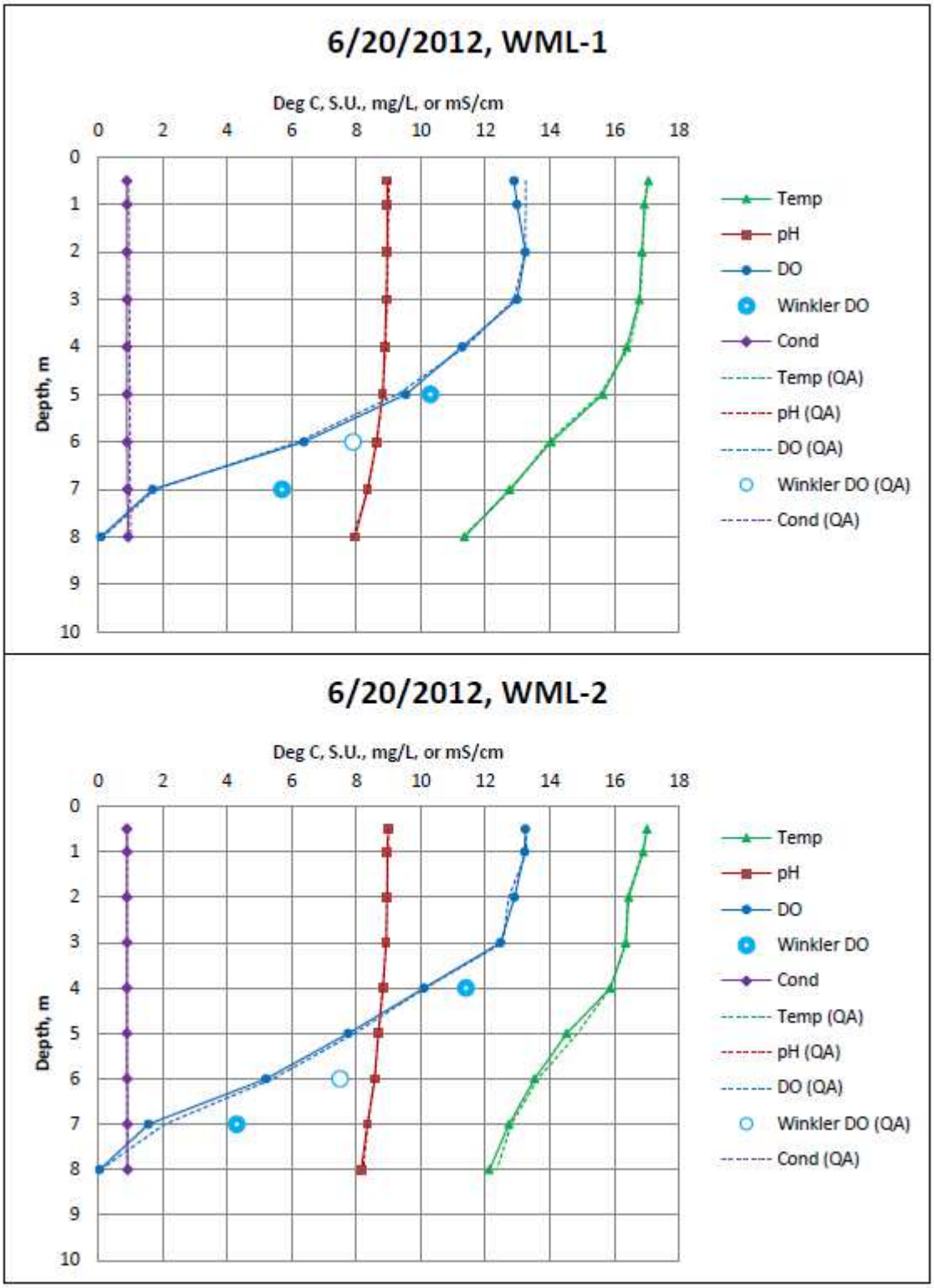
Site Locations

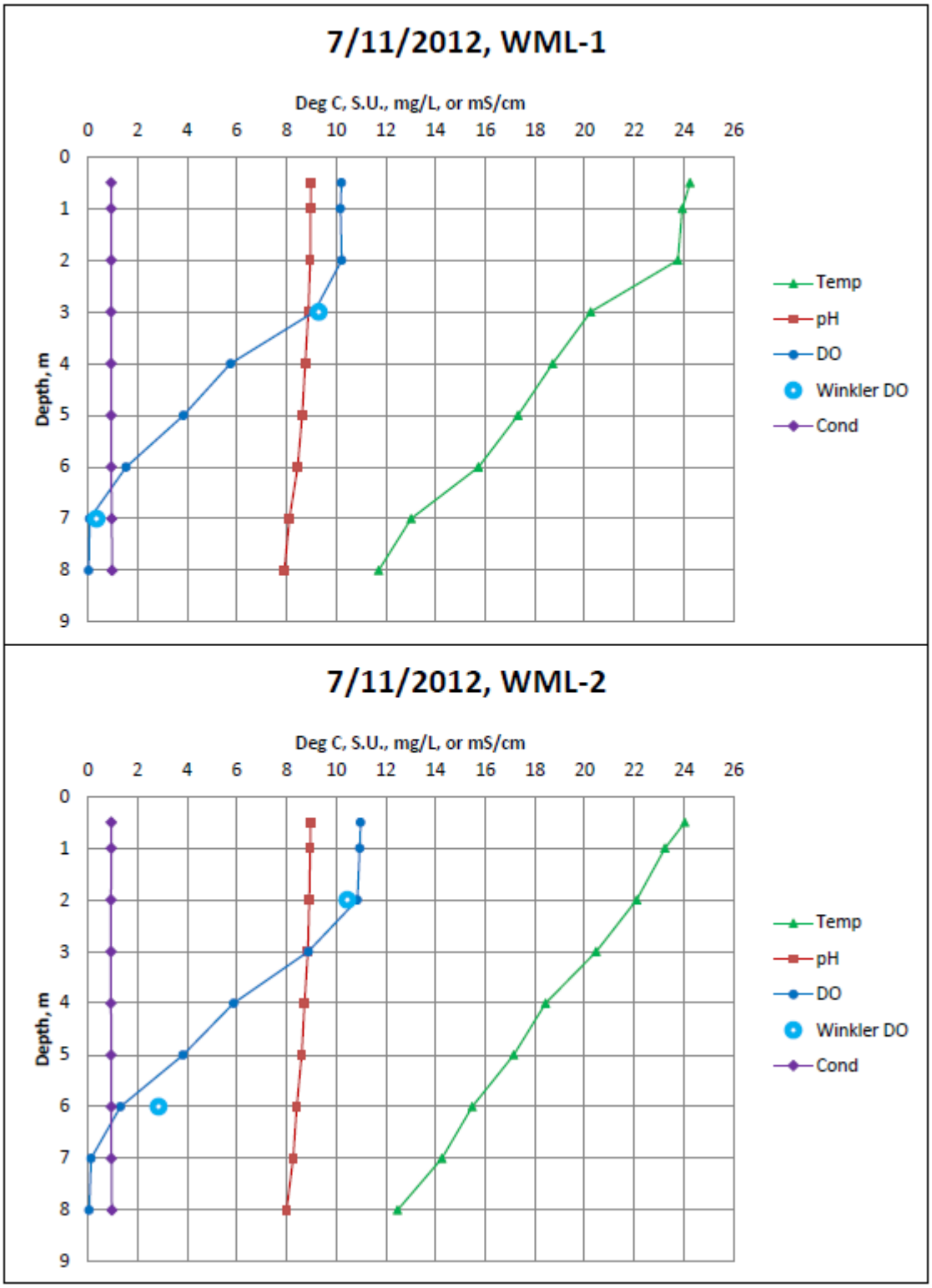


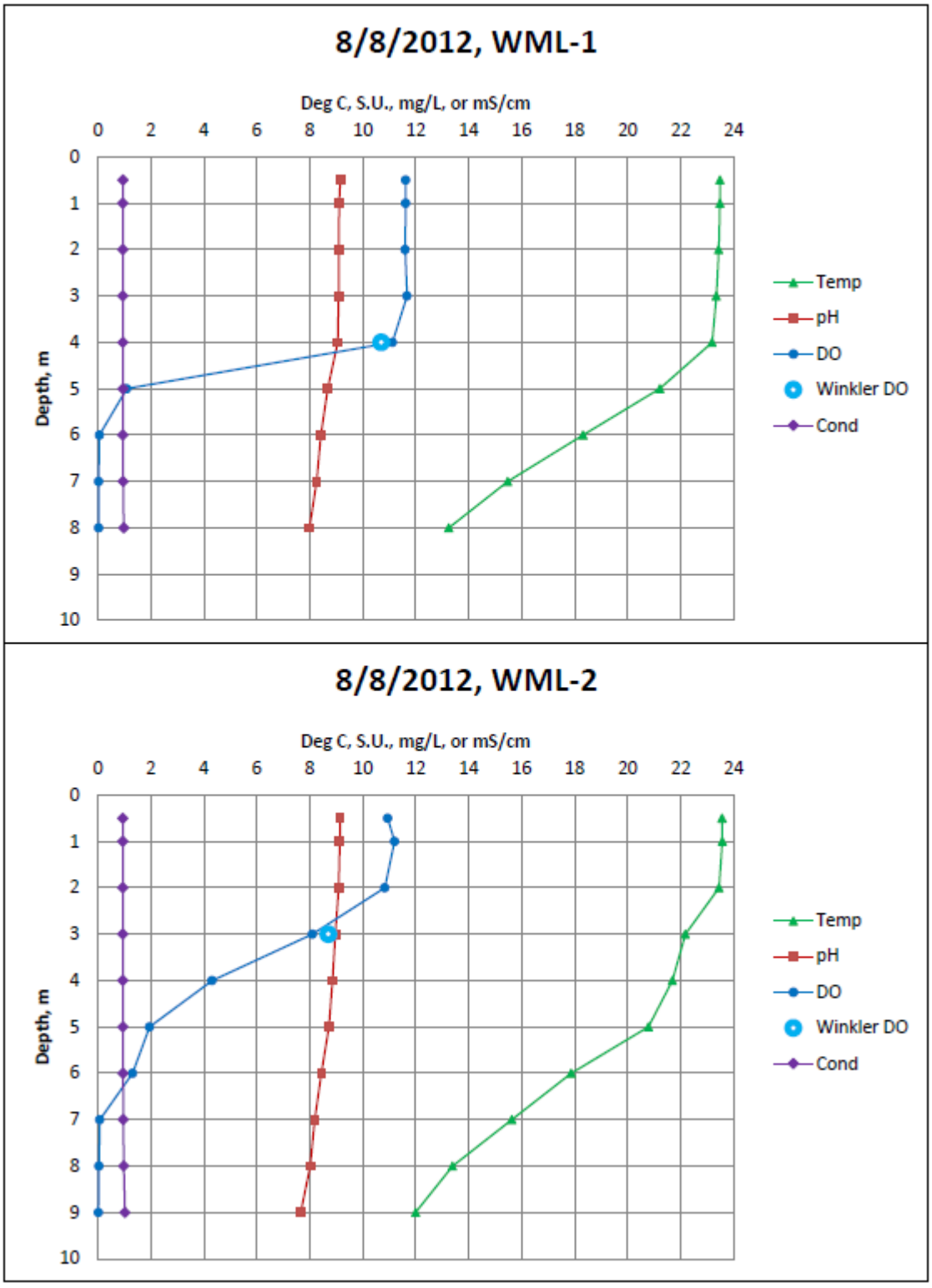
Hydrolab Profiles

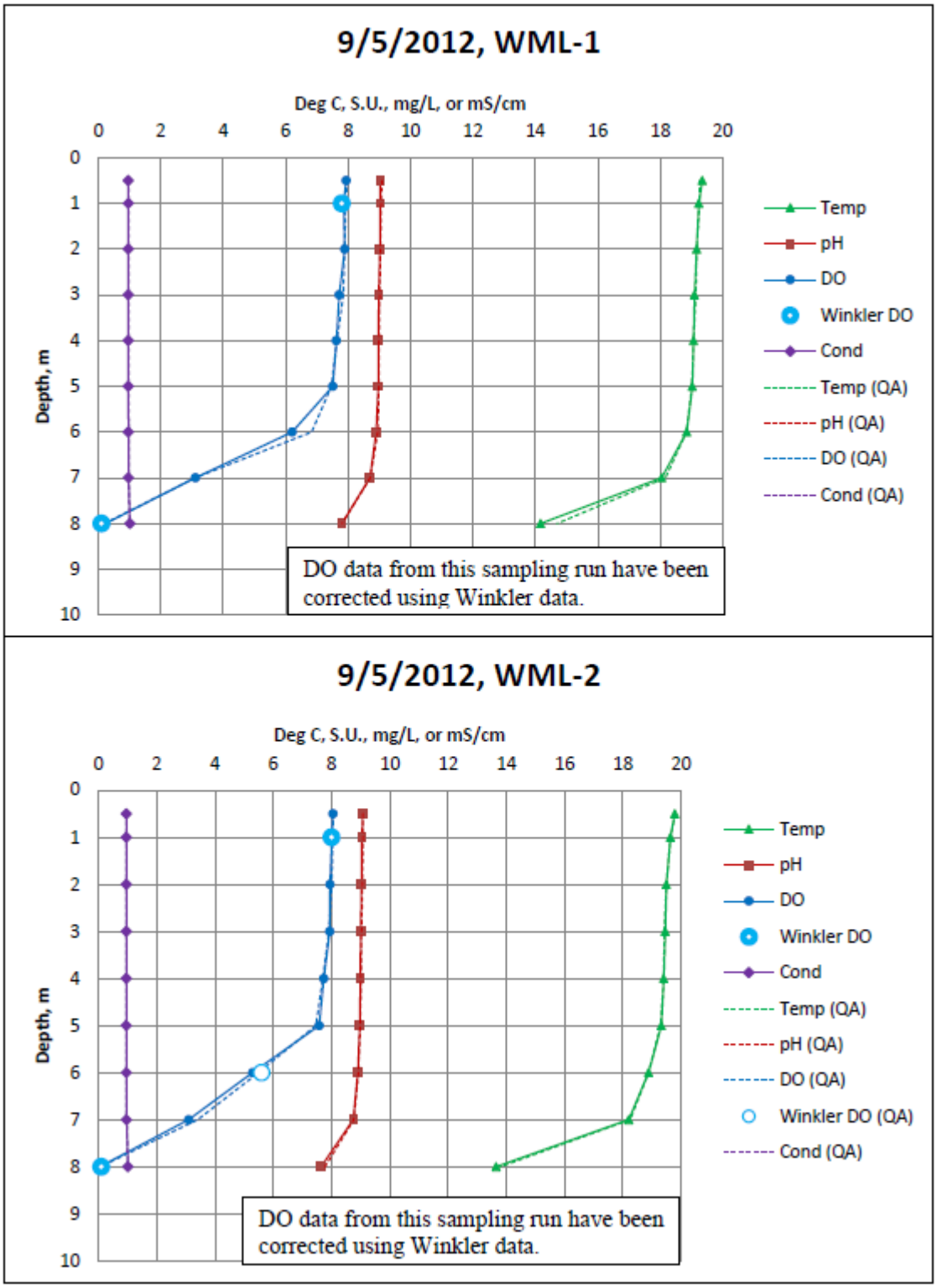


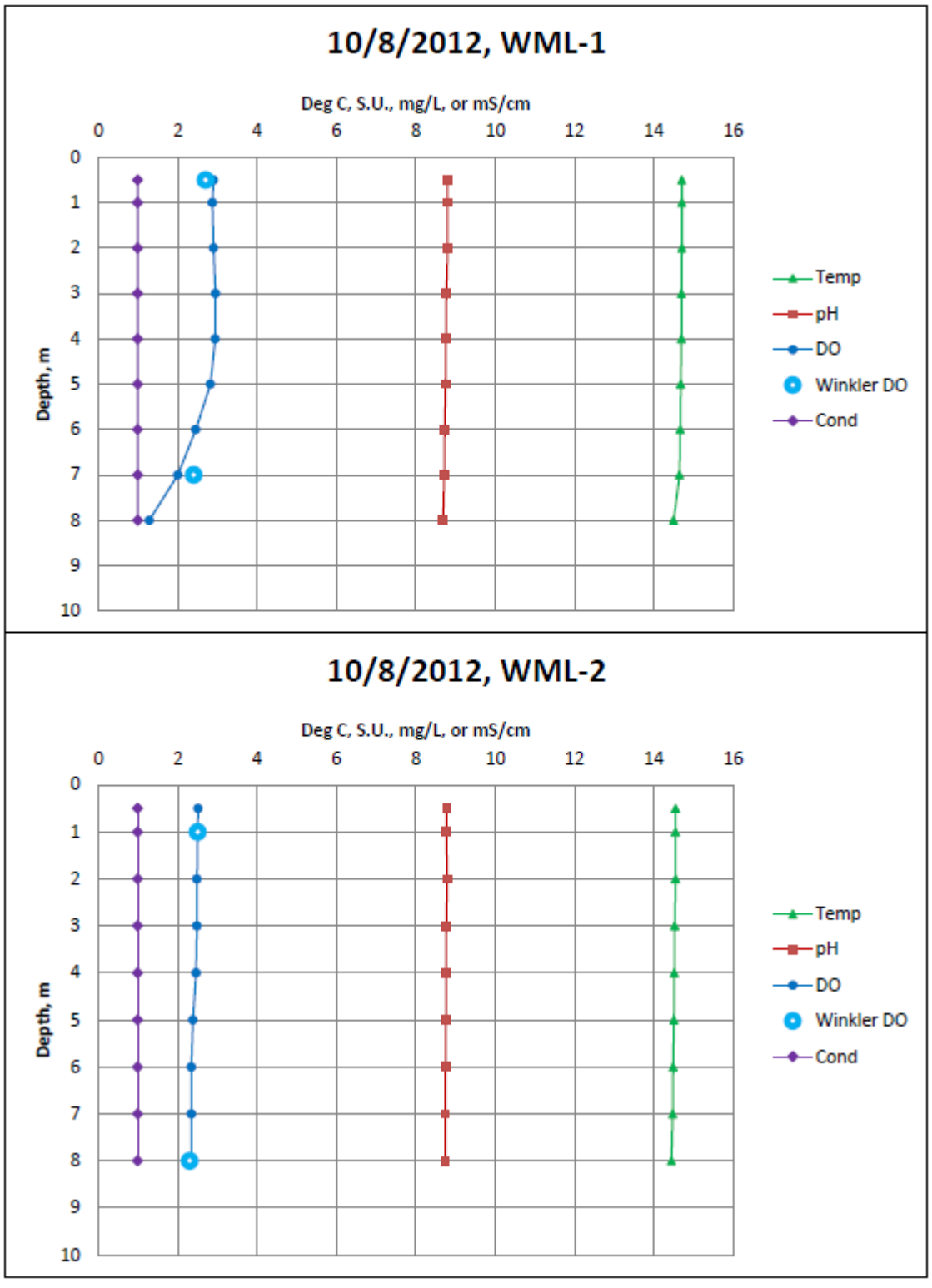

5/9/2012, WML-1
Deg C, S.U., mg/L, or mS/cm
0
2
4
6
8
10
12
14
16
Depth, m
0
1
2
3
4
5
6
7
8
9
10
Temp
pH
DO
Winkler DO
Cond
5/9/2012, WML-2
Deg C, S.U., mg/L, or mS/cm
0
2
4
6
8
10
12
14
16
Depth, m
0
1
2
3
4
5
6
7
8
9
10
Temp
pH
DO
Winkler DO
Cond

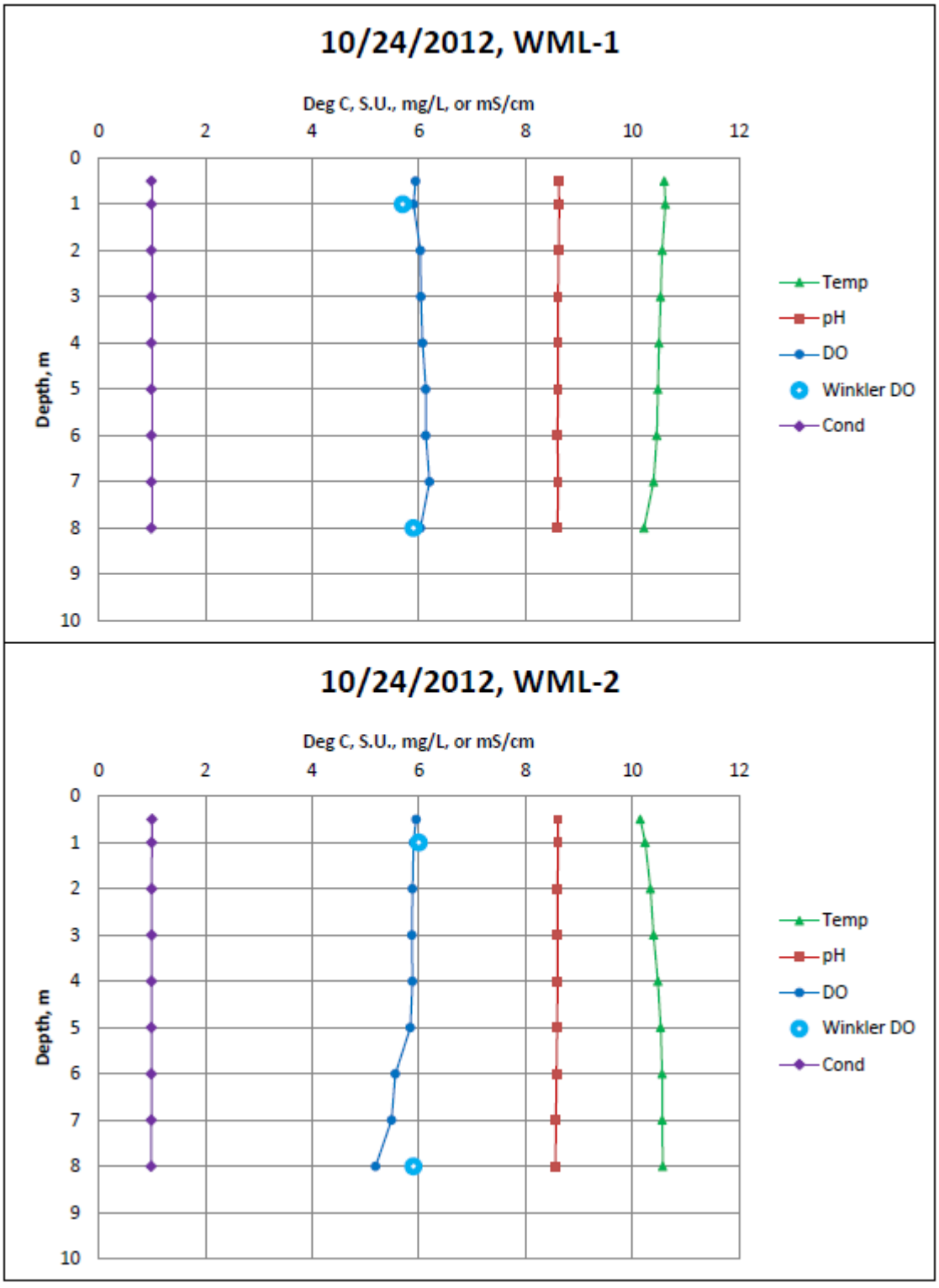

6/20/2012, WML-1
Deg C, S.U., mg/L, or mS/cm
0 2 4 6 8 10 12 14 16 18
Depth, m
0 1 2 3 4 5 6 7 8 9 10
Temp
pH
DO
Winkler DO
Cond
Temp (QA)
pH (QA)
DO (QA)
Winkler DO (QA)
Cond (QA)
6/20/2012, WML-2
Deg C, S.U., mg/L, or mS/cm
0 2 4 6 8 10 12 14 16 18
Depth, m
0 1 2 3 4 5 6 7 8 9 10
Temp
pH
DO
Winkler DO
Cond
Temp (QA)
pH (QA)
DO (QA)
Winkler DO (QA)
Cond (QA)


7/11/2012, WML-1
Deg C, S.U., mg/L, or mS/cm
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Depth, m
0 1 2 3 4 5 6 7 8 9
Temp
pH
DO
Winkler DO
Cond
7/11/2012, WML-2
Deg C, S.U., mg/L, or mS/cm
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Depth, m
0 1 2 3 4 5 6 7 8 9
Temp
pH
DO
Winkler DO
Cond


8/8/2012, WML-1
Deg C, S.U., mg/L, or mS/cm
0 2 4 6 8 10 12 14 16 18 20 22 24
Depth, m
0 1 2 3 4 5 6 7 8 9 10
Temp
pH
DO
Winkler DO
Cond
8/8/2012, WML-2
Deg C, S.U., mg/L, or mS/cm
0 2 4 6 8 10 12 14 16 18 20 22 24
Depth, m
0 1 2 3 4 5 6 7 8 9 10
Temp
pH
DO
Winkler DO
Cond


9/5/2012, WML-1
Deg C, S.U., mg/L, or mS/cm
0 2 4 6 8 10 12 14 16 18 20
Depth, m
0 1 2 3 4 5 6 7 8 9 10
Temp
pH
DO
Winkler DO
Cond
Temp (QA)
pH (QA)
DO (QA)
Cond (QA)
DO data from this sampling run have been corrected using Winkler data.
9/5/2012, WML-2
Deg C, S.U., mg/L, or mS/cm
0 2 4 6 8 10 12 14 16 18 20
Depth, m
0 1 2 3 4 5 6 7 8 9 10
Temp
pH
DO
Winkler DO
Cond
Temp (QA)
pH (QA)
DO (QA)
Winkler DO (QA)
Cond (QA)
DO data from this sampling run have been corrected using Winkler data.


10/8/2012, WML-1
Deg C, S.U., mg/L, or mS/cm
0
2
4
6
8
10
12
14
16
Depth, m
0
1
2
3
4
5
6
7
8
9
10
Temp
pH
DO
Winkler DO
Cond
10/8/2012, WML-2
Deg C, S.U., mg/L, or mS/cm
0
2
4
6
8
10
12
14
16
Depth, m
0
1
2
3
4
5
6
7
8
9
10
Temp
pH
DO
Winkler DO
Cond


10/24/2012, WML-1
Deg C, S.U., mg/L, or mS/cm
0
2
4
6
8
10
12
Depth, m
0
1
2
3
4
5
6
7
8
9
10
Temp
pH
DO
Winkler DO
Cond
10/24/2012, WML-2
Deg C, S.U., mg/L, or mS/cm
0
2
4
6
8
10
12
Depth, m
0
1
2
3
4
5
6
7
8
9
10
Temp
pH
DO
Winkler DO
Cond

Fecal Coliform Data

Date	WML-A	WML-B	WML-C	WML-D
4/4/2012	1 U	1 U	1 U	1 U
4/18/2012	1 U	1 U	1 U (1 U)	1 U
5/9/2012	29	1 U	9	1 U
5/23/2012	9 (4)	3	1 U	1 U
6/6/2012	1 U	2	1 U	4
6/20/2012	1 U	1 U	1 J	1 U (1UJ)
7/11/2012	1 UJ	1 UJ	3	1 UJ
7/25/2012	3	1 U (1U)	2	6
8/8/2012	1 U	1 U	8	1 U
8/22/2012	1 U (3)	13	2	6
9/5/2012	1 U	1 U	1 U	5
9/19/2012	1 U (5)	1 U	1 U	4
10/8/2012	2	1 U	1 U	21
10/24/2012	1 UJ	1 UJ	1 UJ	2J (1UJ)

Results in cfu/100mL.
Values in parentheses are QA sample results.
J - The organism was positively identified. The associated numerical result is an estimate.
U - The organism was not detected at or above the reported limit.
UJ – The organism was not detected at or above the reported estimated limit.

Secchi Measurements

Date	WML-1	WML-2
4/4/2012	3.6	3.4
5/9/2012	2.2	2.0
6/20/2012	2 (2)	1.7 (1.7)
7/11/2012	3.9	4.0
8/8/2012	2.8	2.6
9/5/2012	3.5 (3.7)	4.1 (4.5)
10/8/2012	4.5	4.3

Results are depths in meters.
Values in parentheses are QA measurement results.

Nutrient Data

Date	Site	Layer	NH_4	NO_2-NO_3	TPN	OP	TP
4/4/2012	WML-1	Whole	0.61	0.404	2.16	2.22	2.21
	WML-2	Whole	0.607	0.411	2.19	2.22	2.2
5/9/2012	WML-1	Epilim.	0.072	0.411	1.39	2.03	2.09
		Hypolim.	0.184	0.424	1.59	2.08	2.06
	WML-2	Epilim.	0.115	0.416	1.51	2.07	2.08
		Hypolim.	0.252	0.408	1.61	2.08	2.13
6/20/2012	WML-1	Epilim.	0.012 (0.013)	0.016 (0.014)	1.05 (1.01)	2.24 (2.27)	2.19 (2.27)
		Hypolim.	0.28 (0.277)	0.073 (0.073)	1.44 (1.11)	2.5 (2.5)	2.44 (2.48)
	WML-2	Epilim.	0.015 (0.011)	0.012 (0.015)	1.06 (0.998)	2.22 (2.24)	2.25 (2.27)
		Hypolim.	0.294 (0.252)	0.081 (0.091)	1.27 (1.41)	2.49 (2.44)	2.46 (2.42)
7/11/2012	WML-1	Epilim.	0.017	0.01 U	1.02	1.96	2.2
		Hypolim.	0.586	0.032	1.4	2.69	2.74
	WML-2	Epilim.	0.012	0.01 U	0.935	2.11	2.2
		Hypolim.	0.237	0.06	1.19	2.44	2.51
8/8/2012	WML-1	Epilim.	0.02	0.01 U	1	1.76	1.89
		Hypolim.	0.188	0.014	1.13	2.87	2.78
	WML-2	Epilim.	0.016	0.029	1.04	1.92	1.93
		Hypolim.	0.608	0.023	1.33	2.95	2.95
9/5/2012	WML-1	Epilim.	0.018 (0.011)	0.579 (0.048)	1.72 (1.12)	1.88 (1.87)	1.88 (1.86)
		Hypolim.	0.477 (1.3)	0.01 U (0.022)	1.77 (2.75)	2.75 (3.23)	2.76 (3.32)
	WML-2	Epilim.	0.019 (0.015)	0.01 U (0.01 U)	1.1 (0.747)	1.87 (1.88)	1.88 (1.86)
		Hypolim.	1.39 (1.62)	0.01 U (0.017)	2.8 (3.06)	3.54 (3.77)	3.52 (3.52)
10/8/2012	WML-1	Whole	0.351	0.045	1.48	2.14 J	2.24
	WML-2	Whole	0.37	0.026	1.55	2.19	2.27 J

Results are in mg/L.
Values in parentheses are QA sample results.
U - The analyte was not detected at or above the reported result.
J - The analyte was positively identified. The associated numerical result is an estimate.
UJ - The analyte was not detected at or above the reported estimated result.

Recommended Total Nitrogen criteria for West Medical Lake = 1.36 mg/L. This was calculated from the average concentrations observed during 1998 (Smith, et al. 2000), and can be of use for determining if conditions are improving or deteriorating. TPN (total persulfate nitrogen) is an analysis of total nitrogen and can be compared directly to this criterion.

Ammonia Results vs. Criteria for Toxicity

Date	Site	Layer	pH	Temp	NH_4 - N	Unionized NH_3	Acute Limit*	Chronic Limit**	Violates Acute?	Violates Chronic?
4/4/2012	WML-1	Whole	8.32	5.7	0.61	0.0164	3.03	0.022	no	no
	WML-2	Whole	8.36	5.58	0.607	0.0177	2.80	0.022	no	no
5/9/2012	WML-1	Epilim.	8.87	14	0.072	0.0114	1.09	0.039	no	no
		Hypolim.	8.53	10.66	0.184	0.0115	2.02	0.031	no	no
	WML-2	Epilim.	8.71	11.86	0.115	0.0114	1.45	0.034	no	no
		Hypolim.	8.46	10.48	0.252	0.0133	2.31	0.031	no	no
6/20/2012	WML-1	Epilim.	8.95	16.85	0.012	0.00263	0.96	0.042	no	no
			(8.98)	(16.86)	(0.013)	0.00301	0.91	0.042	no	no
		Hypolim.	8.31	12.71	0.28	0.0126	3.09	0.036	no	no
			(8.3)	(12.69)	(0.277)	0.0121	3.15	0.036	no	no
	WML-2	Epilim.	8.94	16.56	0.015	0.00317	0.97	0.042	no	no
			(8.95)	(16.54)	(0.011)	0.00237	0.96	0.042	no	no
		Hypolim.	8.35	12.79	0.294	0.0145	2.86	0.036	no	no
			(8.38)	(12.93)	(0.252)	0.0134	2.70	0.036	no	no
7/11/2012	WML-1	Epilim.	8.93	22.65	0.017	0.00494	0.99	0.042	no	no
		Hypolim.	8.28	14.38	0.586	0.0278	3.27	0.040	no	no
	WML-2	Epilim.	8.91	21.94	0.012	0.00325	1.02	0.042	no	no
		Hypolim.	8.34	14.87	0.237	0.0133	2.91	0.042	no	no
8/8/2012	WML-1	Epilim.	9.09	23.37	0.02	0.00768	0.77	0.042	no	no
		Hypolim.	8.34	16.9	0.188	0.0122	2.91	0.042	no	no
	WML-2	Epilim.	9.06	23.07	0.016	0.00581	0.81	0.042	no	no
		Hypolim.	8.22	15.63	0.608	0.0277	3.68	0.042	no	no
9/5/2012	WML-1	Epilim.	8.99	19.12	0.018	0.00480	0.90	0.042	no	no
			(9.02)	(19.13)	(0.011)	0.00309	0.86	0.042	no	no
		Hypolim.	8.25	16.11	0.477	0.0240	3.47	0.042	no	no
			(8.26)	(16.44)	(1.3)	0.0684	3.40	0.042	no	YES
	WML-2	Epilim.	9	19.46	0.019	0.00525	0.88	0.042	no	no
			(9.03)	(19.45)	(0.015)	0.00435	0.84	0.042	no	no
		Hypolim.	8.2	15.93	1.39	0.0618	3.83	0.042	no	YES
			(8.27)	(16.03)	(1.62)	0.0846	3.34	0.042	no	YES
10/8/2012	WML-1	Whole	8.76	14.67	0.351	0.0468	1.32	0.041	no	YES
	WML-2	Whole	8.76	14.51	0.37	0.0488	1.32	0.041	no	YES

Values in parentheses are QA sample and measurement results. For sites with QA measurements, the original Hydrolab profile is used to evaluate the primary sample result, and the QA profile is used to evaluate the QA sample result.

*The acute limit applies to the total concentration of ammonia nitrogen.

**The chronic limit applies to the concentration of unionized ammonia.

Nutrient Comparison to past sampling seasons

The following charts compare nutrient data from 2012 to nutrient data collected during previous studies (Smith et al., 2000; Willms and Pelletier, 1992). Data are plotted by lake layer, without regard to which sampling site the samples were taken from. The following is a very brief description of the nutrient data collected in the different years, as well as an explanation of how those data are graphed below:

1990

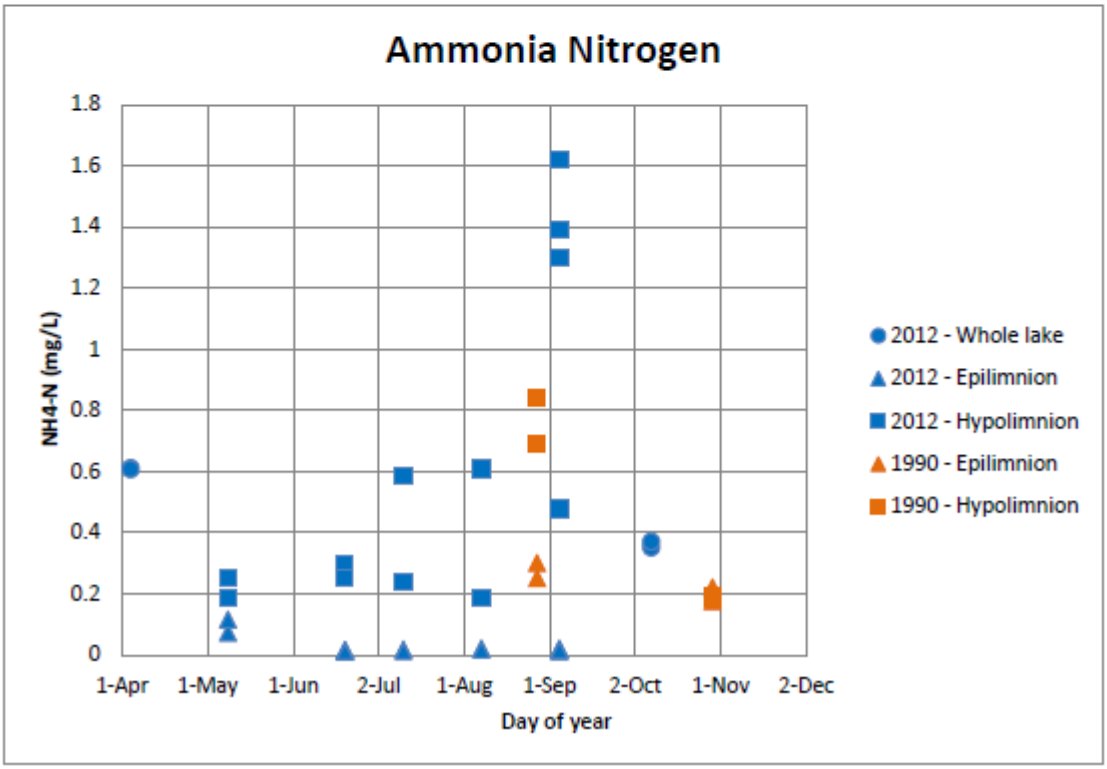
During two sampling runs (5/23/1990 and 8/22/1990), total nitrogen and total phosphorus (but not ammonia, nitrate-nitrite, or orthophosphate) were composited from 1, 3, and 5m. These results are charted as "whole lake" results on the TN and TP graphs. During the other two runs (8/28/90 and 10/30/90), all nutrient parameters were collected, and samples were taken at discrete depths. For purposes of comparability to 1998 and 2012 data, results from 0 and 3m are averaged and plotted as "epilimnion" results, and results from 7 and 8m are averaged and plotted as "hypolimnion" results ("numerical compositing").

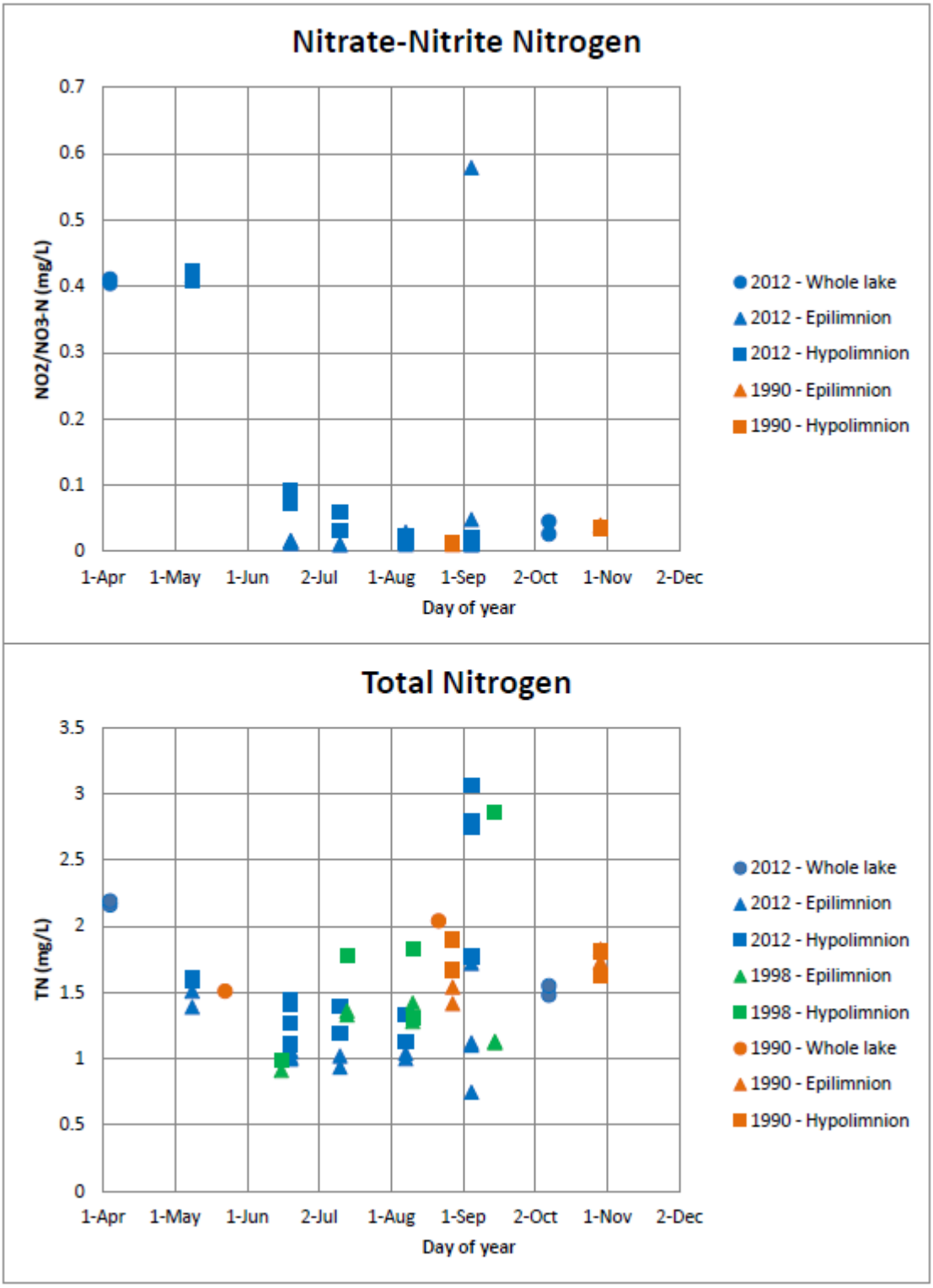
1998

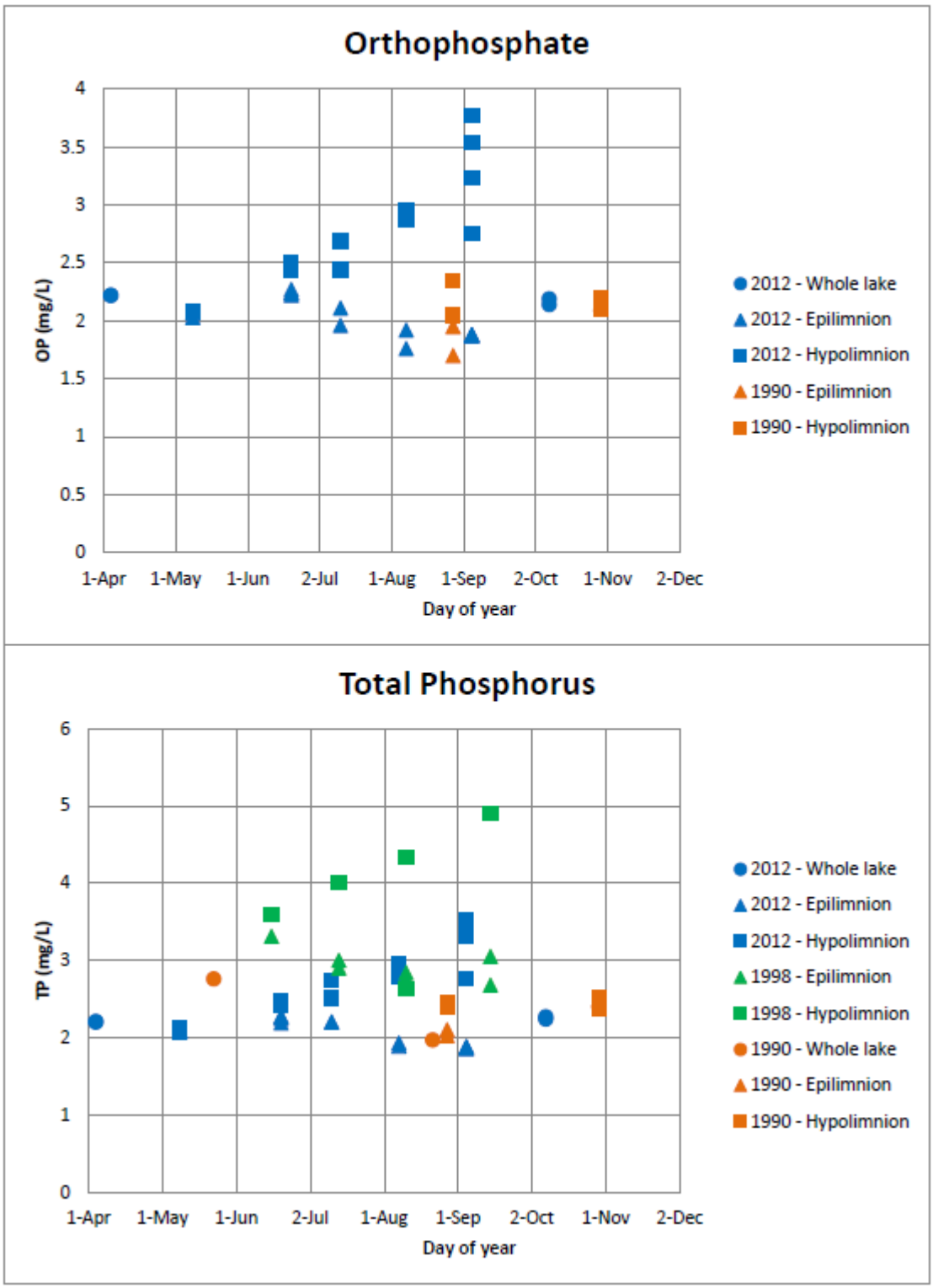
Only total nitrogen and total phosphorus were collected. Composite samples were taken from the epilimnion and the hypolimnion, so these data are directly comparable to 2012 data.

2012

Data are graphed according to "nutrient data" table above.




Nitrate-Nitrite Nitrogen
NO2/NO3-N (mg/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1-Apr
1-May
1-Jun
2-Jul
1-Aug
1-Sep
2-Oct
1-Nov
2-Dec
Day of year
2012 - Whole lake
2012 - Epilimnion
2012 - Hypolimnion
1990 - Epilimnion
1990 - Hypolimnion
Total Nitrogen
TN (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
1-Apr
1-May
1-Jun
2-Jul
1-Aug
1-Sep
2-Oct
1-Nov
2-Dec
Day of year
2012 - Whole lake
2012 - Epilimnion
2012 - Hypolimnion
1998 - Epilimnion
1998 - Hypolimnion
1990 - Whole lake
1990 - Epilimnion
1990 - Hypolimnion


Orthophosphate
OP (mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
1-Apr
1-May
1-Jun
2-Jul
1-Aug
1-Sep
2-Oct
1-Nov
2-Dec
Day of year
2012 - Whole lake
2012 - Epilimnion
2012 - Hypolimnion
1990 - Epilimnion
1990 - Hypolimnion
Total Phosphorus
TP (mg/L)
6
5
4
3
2
1
0
1-Apr
1-May
1-Jun
2-Jul
1-Aug
1-Sep
2-Oct
1-Nov
2-Dec
Day of year
2012 - Whole lake
2012 - Epilimnion
2012 - Hypolimnion
1998 - Epilimnion
1998 - Hypolimnion
1990 - Whole lake
1990 - Epilimnion
1990 - Hypolimnion

Commentary:

Nitrogen levels appear to be in the same general range during all three studies. Phosphorus levels were generally similar during 1990 and 2012, but considerably higher during 1998. Phosphorus levels showed increasing stratification (epilimnion vs. hypolimnion) throughout the course of the summer, both in 1998 and 2012. Nearly all of the phosphorus present is orthophosphate.

It is beyond the scope of this project to explain these phenomena, but the following factors probably play a role:

- History of nutrient loading from Eastern State Hospital and Lakeland Village WWTPs (prior to 2000)
- Continued nutrient loading at a reduced degree through the reclaimed water used for lake level control
- Biological processes/nutrient cycling

References

Smith, A.K., D. Hallock, and S. O'Neal, 2000. Water Quality Assessments of Selected Lakes within Washington State: 1998. Washington State Department of Ecology, Olympia, WA. Publication No. 00-03-039.
https://fortress.wa.gov/ecy/publications/summarypages/0003039.html

Stuart, T., 2012. Quality Assurance Project Plan: West Medical Lake Verification Monitoring. Washington State Department of Ecology, Olympia, WA. Publication No. 12-03-103.
https://fortress.wa.gov/ecy/publications/summarypages/1203103.html

Willms, R. and G. Pelletier, 1992. Impacts of Eastern State Hospital and Lakeland Village Wastewater Discharges on the Quality of West Medical Lake. Washington State Department of Ecology, Olympia, WA. Publication No. 92-e63.
https://fortress.wa.gov/ecy/publications/summarypages/92e63.html